Public Health
Laboratory Service

Stack

PHLS
Annual Report
1981/2

NOT TO BE
TAKEN AWAY

REFERENCE ONLY

Accession number 18700 Class REPORT

Clinical Research Centre
John Squire Medical Library
Watford Road, Harrow
Middlesex HA1 3UJ

22502911908

PHLS

Annual Report

1981/2

John Squire Medical Library

Printed and published by the
Public Health Laboratory Service Board,
61 Colindale Avenue, London NW9 5EQ

ISSN 0142 3517

Published 1983

WELLCOME
LIBRARY
Ann Rep
WA28
.BA1
P97
1981/82

Clinical Research Centre,
John Squire Medical Library
Watford Road, Harrow
Middlesex HA1 3UJ

Acc. No 18700 Class

Contents

Introduction 1

Sir Robert Williams 2

The PHLS: What It Is and What It Does 3

The Public Health Laboratory Service Board, 1981/2 7

Report of the Director 9
- Regional and area laboratories 9
- Communicable Disease Surveillance Centre 13
- Central Public Health Laboratory 18
- Centre for Applied Microbiology and Research 27
- Other reference laboratories and units 33
- Computer services 35
- Headquarters Office 36

Special Topics 37
- Contaminated first-aid dressings 37
- Current work on *Clostridium difficile* - a newer intestinal pathogen 38
- Factors contributing to outbreaks of food poisoning in England and Wales 38
- Hepatitis A 40
- Whooping cough vaccine 41
- 'Virus strikes newsmen' 41

Special Problems 43
- Horses' graveyards 43
- An infective perk 44
- Fast food safety 45
- Freeze-dried caterpillars 45
- Fracture prevented 45

Senior PHLS Staff 46
- Headquarters Office 46
- Central Public Health Laboratory 46
- Centre for Applied Microbiology and Research 47
- Communicable Disease Surveillance Centre 47
- Other reference laboratories and units 48
- Regional laboratories 48
- Area laboratories 49

Principal Committees 51
- Committees appointed by the Board 51
- Committees appointed by the Directors' Meeting 51
- Subcommittees and working parties 51

Senior Staff Changes 53
- New appointments 53
- Transfers 53
- Retirements 54

Resignations 54

Honours, Awards and External Offices 55

Publications by Members of Staff during 1981 56
- Papers, abstracts and contributions to edited volumes 56
- Books 87
- Reports of the PHLS, including reports of committees and working parties 87
- Reports of committees and working parties of other organisations to which members of staff have contributed 88

Accounts of the PHLS Board 1981/2 91

New Buildings: Capital Expenditure 94

Introduction

Some changes have been thought desirable in the content and arrangement of the Annual Report for 1981/2, not least in consequence of the Governmental decision that holds the PHLS Board to be a Non-Departmental Public Body 'with executive, administrative, regulatory or commercial type functions', to which the Guide for Departments provided by the Civil Service Department (now the Management and Personnel Office of the Treasury) applies. Amongst its other stipulations the Guide requires that Non-Departmental Public Bodies should publish audited accounts with their Annual Reports and, if such Annual Reports are published separately from the relevant Parliamentary White Paper account, as is done with those of the PHLS Board, they should not be published before that account. The accounts of the Board for 1981/2, which will be found at page 91, were laid before Parliament early in 1983.

The Guide also enjoins that Annual Reports should 'be as informative as possible without being lavish, and should provide sufficient material for the reader to form a judgement of the cost-effectiveness of the organisation's activities and on the cost and benefits involved'. With these objectives in mind it was decided to reinstate the section describing the structure and functions of the PHLS so that the reader might be aware of the general background of activity against which to view the matters referred to in the Report, and to make various other changes in its presentation.

Sir Robert Williams

Sir Robert Williams, Director of the Service since 1973, retired on 30th June 1981. His appointment spanned a period of substantial change and development in the PHLS, exemplified by the creation of the Communicable Disease Surveillance Centre and the establishment of the Centre for Applied Microbiology and Research at Porton Down. The wisdom and skill with which Sir Robert conducted the increasingly complex affairs of the Service have earned him the continuing gratitude of its members and the Board; that he was also President of the Royal College of Pathologists from 1975 to 1978 and of the Association of Clinical Pathologists from 1979 to 1980 is a measure of his standing and his energy. Sir Robert joined the original staff of the Central Public Health Laboratory, Colindale, in 1947; before he retired, he had had the satisfaction of personally inaugurating the start on the site of the long delayed new building. (This photograph is reproduced by kind permission from an original oil painting by June Mendoza at the Royal College of Pathologists. Photograph by Kevin G Freeman.)

The PHLS What It Is and What It Does

LEGISLATIVE BACKGROUND

In 1945 the Government decided to put the Emergency Public Health Laboratory Service on a permanent footing and the Medical Research Council (MRC) agreed with the Ministry of Health to continue their administration of it for five years. Statutory authority was given by Section 17 of the NHS Act 1946 to the Minister to provide a bacteriological service for the control of the spread of infectious diseases.

The PHLS Act 1960 established and incorporated a new PHLS Board as a statutory body, capable of acting in its own right as an agent for the Minister of Health. The Act also transferred the staff from the employment of the MRC to that of the Board and transferred property from the Council to the Ministry.

The NHS Act 1977 (Schedule 3) incorporated the PHLS Board. Part I dealt with the formal consititution of the Board and Part II with staffing and financial provisions. The PHLS Act 1978 gave responsibility to the Board for the former Microbiological Research Establishment of the Ministry of Defence at Porton Down and extended the Board's powers to carry out such other activities as in the Secretary of State's opinion can be conveniently carried on in conjunction with the Service.

The PHLS is administered by a Statutory Board, closely analogous to a Regional Health Authority or a Special Health Authority. It is an integral part of the National Health Service and has responsibility extending over the whole of England and Wales. The staff receive the same rates of pay as those employed in the NHS, which may only be varied by direction of the Secretary of State, and are required to join the NHS Superannuation Scheme. The Board's staff formally came within the purview of the Health Services Whitley Councils on 1 March 1981. The Board has Management representatives on the PTA and PTB Councils.

STRUCTURE

The PHLS comprises 52 regional and area laboratories distributed throughout England and Wales (see Figure 1), and 23 reference and special laboratories or units, most of which are grouped in the Central Public Health Laboratory, Colindale, North London, or at the Centre for Applied Microbiology and Research, Porton Down, Wiltshire.

FUNCTIONS

The PHLS operates as a network of centrally co-ordinated laboratories in accordance with its statutory obligation to provide a microbiological service for the diagnosis, control and prevention of communicable diseases. It does this by giving a routine microbiological service to several hospitals, and providing reference facilities that are available nationally. It collates information on the incidence of infection, and when necessary it institutes special enquiries into outbreaks and the epidemiology of infectious disease, although executive responsibility for their control is the statutory responsibility of local authorities. It also undertakes bacteriological surveillance of the quality of food and water for local authorities and others. The PHLS is often called upon to advise central and local government and the hospital service on many aspects of infectious disease. It maintains close contact with veterinary organizations in areas of mutual interest, and collaborates with the World Health Organisation and with national laboratory and epidemiological services overseas.

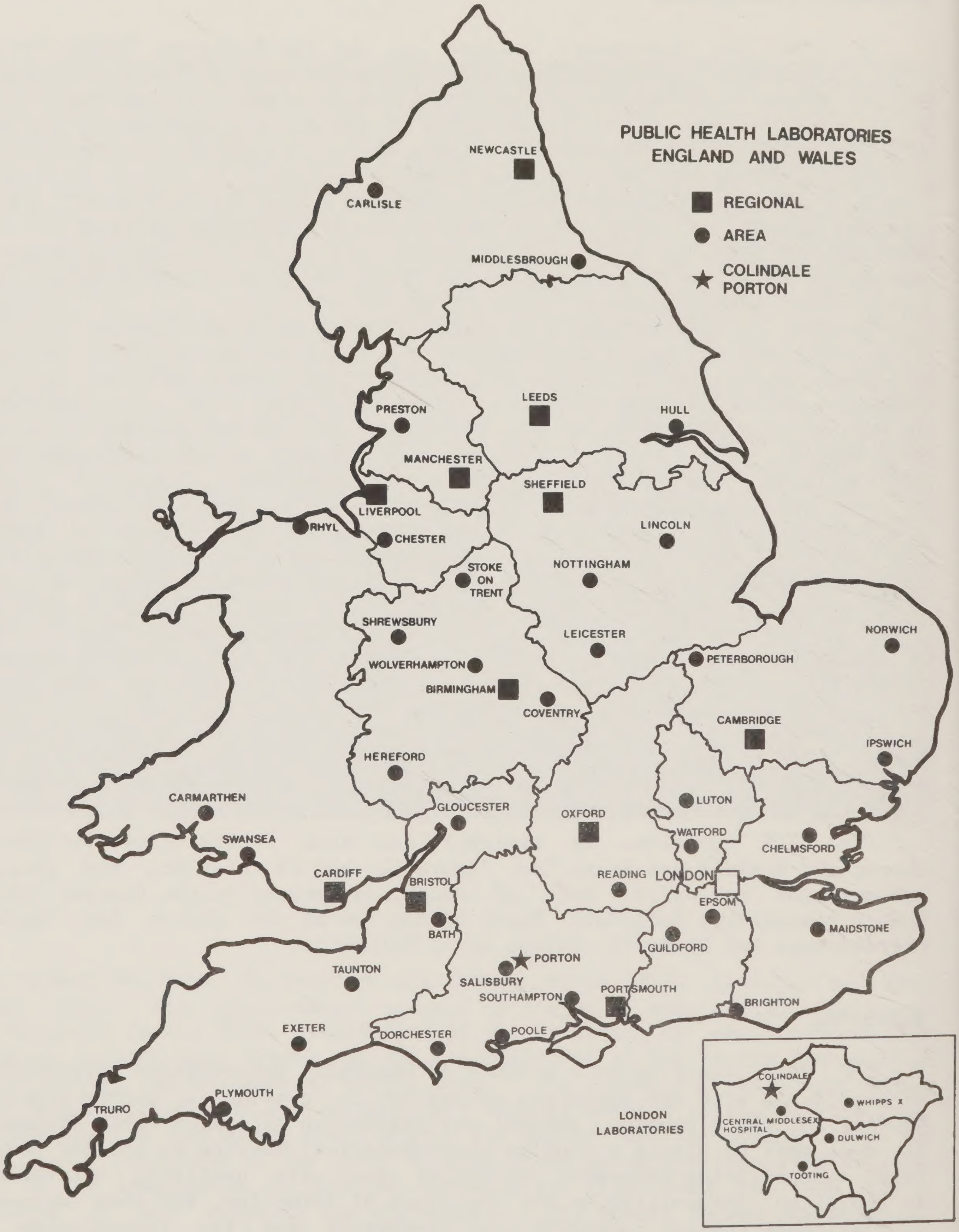

Figure 1 Map showing the distribution of PHLS laboratories.

ROUTINE DIAGNOSTIC MICROBIOLOGICAL SERVICE

Nearly all of the regional and area laboratories are situated in or are closely associated with hospitals, providing them with their routine clinical microbiological service. They also serve general practitioners, Medical Officers for Environmental Health, other doctors caring for communities and Environmental Health Officers. By means of this continuous sampling the PHLS monitors the infections which bring patients to hospital or which attack them while they are there, as well as becoming aware of the distribution of infectious disease in the community.

REFERENCE AND SPECIAL FACILITIES

Most of the regional and some of the area PHLS laboratories carry out special tests for neighbouring PHLS and NHS laboratories. All PHLS laboratories are available to assist local hospital laboratories in investigating outbreaks of infection, if asked to do so.

Further back-up facilities are provided by the reference laboratories or units which carry out various tests for the PHLS and hospital laboratories throughout the United Kingdom. These tests usually require special expertise, techniques and facilities which it would be uneconomic or impossible to provide more widely. As well as carrying out special tests such as the 'fingerprinting' of organisms for epidemiological purposes, reference laboratories conduct research and act as sources of advice on many aspects of the control of communicable disease.

The PHLS special laboratories develop and produce therapeutic, prophylactic and diagnostic materials for use by the NHS and others, as well as by the Service itself. They also monitor commercially available reagents and provide test material to PHLS and hospital laboratories to enable them to assess the quality of their routine performance. The National Collection of Type Cultures (of bacteria of interest to medicine) is a constituent part of the Central Laboratory at Colindale.

DISEASE SURVEILLANCE AND CONTROL

A special unit, the Communicable Disease Surveillance Centre, analyses information about the whole range of infectious diseases from the regular reports they receive from the PHLS and hospital laboratories. These data form a continuously changing, up-to-date picture of communicable disease throughout the country. This is published weekly in the Communicable Disease Report, which is issued to microbiologists, community physicians and others concerned with disease control, supplementing information available from the statutory notifications and other sources. In addition to gathering information, the Centre co-ordinates the investigation and control of incidents of communicable disease of national importance and of outbreaks involving more than one local authority.

A unique feature of the PHLS is its ability, at short notice, to call on the very wide range of knowledge and ability available among its nationally distributed specialist staff. Working parties with appropriate skills can thus be formed to tackle new problems as they arise, achieving the highest probability of producing a speedy and useful result. There have been several examples of this system operating in recent years, to the considerable benefit of the community.

The Epidemiological Research Laboratory undertakes surveillance of the effectiveness and safety of many of the immunization programmes in current use, and evaluates new immunization procedures.

RESEARCH

Most PHLS laboratories are engaged in some research, and many regional laboratories, and especially the reference and special laboratories, have extensive research programmes. The PHLS Centre for Applied Microbiology and Research, Porton, in particular has a substantial programme of research and development in biotechnological processes and their application, mainly but not exclusively in the field of health care. The Service has a number of committees which organize collaborative research projects and arrange for the testing of new ideas and methods.

SURVEILLANCE OF FOOD AND DRINK

All regional and area laboratories provide a microbiological service to local authorities for the examination of water, milk and, increasingly, other foodstuffs, including imported foods examined at the port of entry or centre of distribution. Raw foods, in particular meat and poultry, and animal feeds known to spread agents of food poisoning are monitored to trace the origin and transmission of these organisms. Food-poisoning bacteria are studied in relation to their survival or multiplication in foods and preventive measures are suggested in the light of results. Laboratories are often called on to examine foodstuffs in the course of investigating outbreaks of infection and they may be invited to advise manufacturers.

ACCEPTANCE OF SPECIMENS

The material examined in PHLS laboratories comprises 'clinical' specimens (throat swabs, blood, faeces, etc.) from persons suspected of suffering from a microbial disease, or of being carriers of pathogenic microbes, and non-clinical ('sanitary') specimens, such as food and water, submitted either as part of an epidemiological investigation or for routine public health surveillance.

Clinical specimens must be submitted by medical practitioners, veterinarians, dentists or those acting directly on their behalf. Clinical specimens are not accepted from other private persons.

Sanitary specimens can be submitted by Medical Officers for Environmental Health and Environmental Health Officers (or members of their staff) acting on behalf of the local authorities. The PHLS is always ready to give advice to food manufacturers and distributors; however, although it may carry out limited microbiological investigations related to the inquiry, it does not ordinarily undertake routine examinations for commercial organisations.

The reference and special laboratories receive only specimens sent from other laboratories. Their services are available to all PHLS, NHS and other official laboratories in the United Kingdom.

The Public Health Laboratory Service Board

Chairman

C E Gordon Smith, CB, MD, DSc, FRCP, FRCPath
Dean, London School of Hygiene and Tropical Medicine

Members

F J Aldridge
lately Under-Secretary and Controller of Supply, Department of Health and Social Security

A D Bostock, MB, MFCM, DPH
Specialist in Community Medicine, Leeds AHA(T)

T H Flewett, MD, FRCP, FRCPath
Regional Virus Laboratory, East Birmingham Hospital

W G Harding, CBE, FRCP, FFCM, DPH
lately Area Medical Officer, Camden and Islington AHA(T), London

E L Harris, CB, MB, FRCPE, FRCP, FFCM
Deputy Chief Medical Officer, Department of Health and Social Security

J R Hepple, BSc (from 1.8.81)
Technical Director, Hoechst Animal Health Laboratories

R G Hoare, CBE, FPS
lately Chairman, Pharmaceutical Division, ICI

W C D Lovett, OBE, MD, FFCM, DPH, DTM&H
Principal Medical Officer, Health and Social Work Department, Welsh Office, Cardiff

Professor F W O'Grady, TD, MSc, MD, FRCP, FRCPath
Professor of Microbiology, University of Nottingham

Professor M H Richmond, MA, PhD, ScD, FRCPath, FRS
Vice-Chancellor, University of Manchester

A J Rowland, MB, FFCM, DPH, DObstRCOG
District Community Physician, Bristol Health District (Teaching)

Professor J A Scott, MD, FFCM, BAO
Regional Medical Officer, Trent Regional Health Authority

Lady Sherman, JP (to 31.7.81)
Member, The City and East London Area Health Authority (Teaching)

	Professor R A Shooter, CBE, MA, MD, FRCP, FRCPath, FRCS Professor of Bacteriology, St Bartholomew's Hospital Medical School, London
	C C Stevens, OBE, LLB, FPS Chairman, Cheshire Area Health Authority
	W O Williams, OBE, MD, FRCGP lately General Practitioner, Swansea, Glamorgan
Staff Assessors to the Board	**B S Chessum,** FIMLS
	P G Mann, MD, FRCPath, DipBact
	A G Taylor, PhD
Secretary	**R S Sawyer,** ACIS (until 31.1.82)

Report of the Director

REGIONAL AND AREA LABORATORIES

For the first time there is an indication that the steady growth in the number of specimens received year by year by the PHLS may be coming to an end. No fewer than 20 of the 52 regional and area laboratories examined fewer specimens in 1981 than in 1980. Despite this, as may be seen in Figure 2, the overall total has risen once more, but this is due to a significant increase in activity in only nine laboratories. In most cases this can be attributed to special factors such as growth due to amalgamation or new hospital buildings, or to further progress towards achieving an average level of activity from a lower baseline. In one case the increase amounted to 300%.

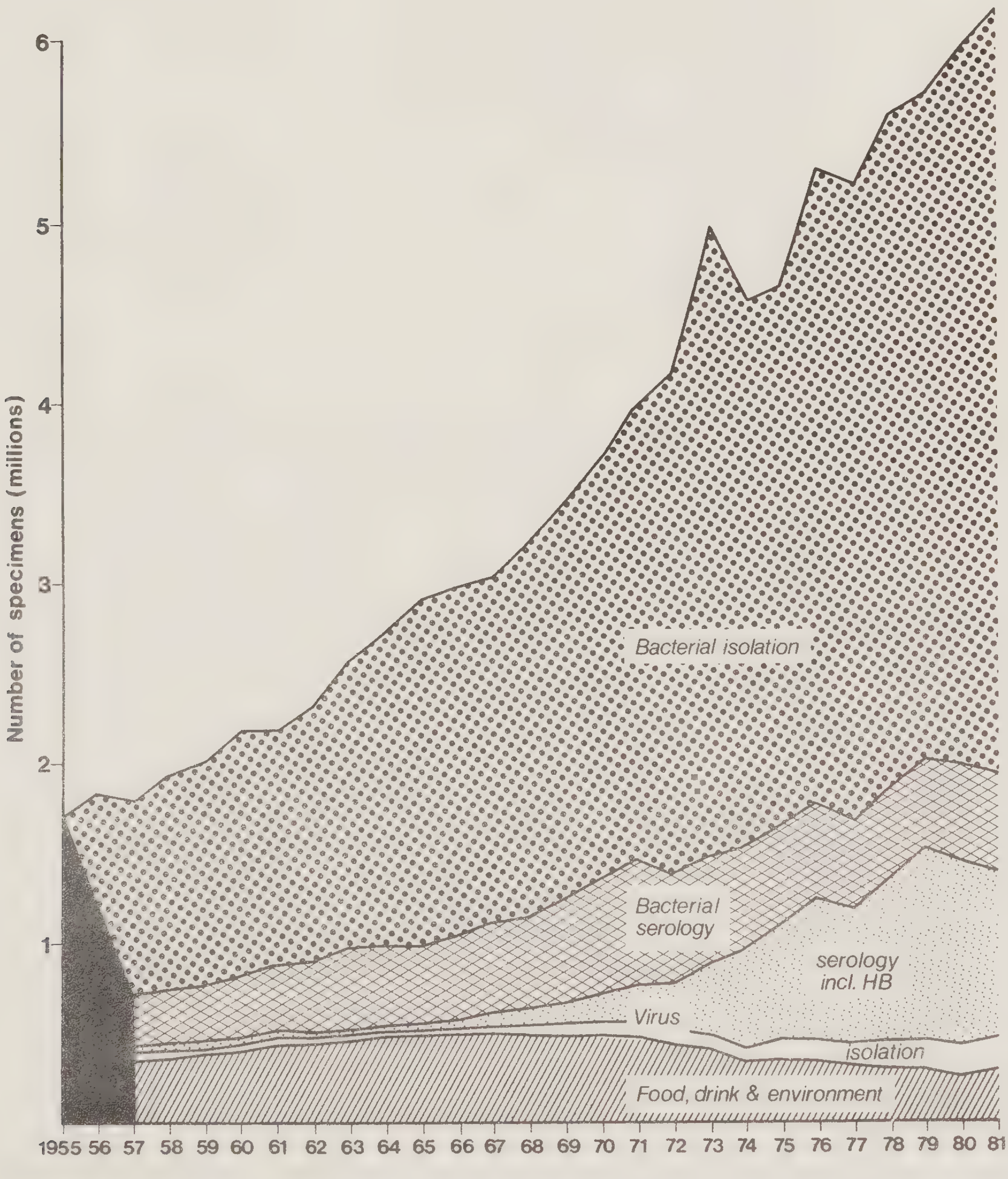

Figure 2 Number of specimens examined in PHLS laboratories, 1955–81.

The numbers of the specimens examined in 1981 in each of the categories listed in Table 1 do not differ significantly from those recorded in 1980, with the exception of sera for rubella antibody determination. The number of these has fallen once more, the reduction totalling 25% since 1979.

Table 1 Specimens examined in regional and area laboratories, 1981

Source	Examination	No. of specimens	Totals
Humans	Isolation of bacteria		
	Nose, throat and mouth	261 512	
	Sputum (excluding TB)	156 951	
	Faeces, rectal swabs	332 050	
	Urine	1 863 661	
	Blood cultures	178 246	
	Others	1 293 207	4 085 627
	Sputum for tuberculosis	119 928	119 928
	EM virus diagnosis	33 184	33 184
	Isolation of virus/chlamydia	152 453	152 453
	Detection of antibody/antigen		
	Venereal diseases	436 038	
	Other bacterial	81 452	
	Rubella	587 786	
	Hepatitis	144 450	
	Other virus	176 526	
	Toxoplasma	22 298	1 448 550
	Antibiotic assays	25 275	25 275
Animals		2 382	2 382
Food	Milk	50 017	
	Ice-cream	20 832	
	Other food	60 935	
	Drinking water	70 488	202 272
Other sanitary	Bathing water	31 325	
	Other	73 172	104 497
Total			6 174 168
Reference specimens, various			86 147
Grand total			6 260 315

Staff numbers

Table 2 shows the numbers of staff by grades and employing authority working in regional and area laboratories at 31st March 1982.

Table 2 Numbers and grades of staff working in regional and area laboratories at 31st March 1982 (in whole-time equivalents)

Grade	Employing authority		
	PHLSB	RHA/AHA	Total
Consultants	88	20	108
Other Medical	51	40	91
Top Grade and Principal Microbiologists	14	1	15
Other Microbiologists	46	7	53
Technical Officers, Principal and Senior Chief MLSOs	54	24	78
Other MLSOs	756	464	1220
Administrative and Clerical	215	67	282
Ancillary and others (i.e. Craftsmen)	269	90	359
Totals	1493	713	2206

Expenditure

The accounts of the Service for this financial year are presented on pages 91-93.

Laboratories

The total number of regional and area laboratories is unchanged at 52. A start was made on the construction of new buildings for the laboratories at Gloucester and at Ashford (to replace the Maidstone laboratory) and on work to improve and extend accommodation elsewhere (see under New Buildings: Capital Expenditure, page 94).

In October 1981 the Board approved the establishment of the PHLS Anaerobe Reference Unit as an integral department of the Luton laboratory to provide, under the direction of Dr A T Willis, a reference service in clinical anaerobic bacteriology for England and Wales. This occupies about 100 square metres of a new extension to the laboratory, provided at a cost of £148 000 to the Board. The work of the unit includes identification of anaerobic bacteria, evaluation of equipment and materials developed for use in anaerobic bacteriology, training of visiting workers - many from overseas - in anaerobic techniques and advising on anaerobic bacteriology. The unit was opened by the Director of the Service at an informal ceremony on 23rd October 1981.

The Secretary of State for Wales visited the Rhyl laboratory briefly in its new accommodation during his tour of Ysbyty Glan Clwyd, Bodelwyddan, on 13th June 1981.

Routine activities

These continued in a similar pattern to those of previous years with, here and there, changes of emphasis according to prevailing interest in certain infections and specific microbes. The work of the laboratories divides itself broadly into microbiology for the hospitals of which they are part and for the communities in which they are situated. In practice this is an artificial distinction, for it often happens that the diagnosis of a particular infection in a patient admitted to hospital is the first sign of its presence in the community and the signal for investigation of the possible source and spread to others. Conversely, hospitals are by no means exempt from the outbreaks which may affect semi-closed communities and their investigation and control call for the appropriate microbiological techniques.

Many laboratories are now able to undertake the laboratory diagnosis of legionnaires' disease, the necessary methods having become assimilated into routine practice. Several laboratories report increasing requests from venereologists for tests for chlamydial infection of the genital tract; such tests are labour-intensive and their accommodation on the scale asked for has presented difficulties for laboratories at a time of financial stringency. Growing use is being made of immunofluorescence for the rapid diagnosis of certain virus infections and many laboratories are acquiring experience of newer, sensitive serological methods, in particular enzyme-linked immunosorbent assay (ELISA). More rapid and sensitive techniques are now in use for the assay of potentially toxic antibiotics, particularly the aminoglycosides, enhancing thereby the support and advice which the laboratories are able to offer clinicians in the treatment of infective disease. The spread of antibiotic-resistant bacteria in the hospital environment is another area which has demanded much attention in many laboratories and the ever-present possibility of imported exotic infections has been realised on several occasions.

Several laboratory directors report that advice is sought from them on problems of communicable disease of a kind that would formerly have been sought from Medical Officers of Health, reflecting both vacancies in the posts of their successors, the Medical Officers for Environmental Health, and the generalist training and interests of many specialists in community medicine. Among the problems on which advice is requested is the use of vaccines; following the occurrence of a case of rabies, one of the regional laboratories which holds and distributes rabies vaccine received two or three telephone calls a day for the next two months from persons who thought they were at risk from the disease. Each, almost without exception, had to be followed up to try to trace the responsible animal and assess the human risk, in some cases as far away as Canada and the USA.

Prolonged heavy snowfall and subsequent flooding early in 1982 not only resulted in additional testing of water supplies for contamination, but in one area food was being sold from snow-bound container lorries; the discovery of contamination by salmonellas put an end to this illegal traffic. Changing food habits have led to microbiological examination of goats' milk, frogs' legs from India, shrimps from Bangladesh, a factory producing frozen Chinese food and semi-frozen syrup drinks ('Slush Puppies') amongst others.

The incompletely understood epidemiology of infections by campylobacters, now recognised as the commonest bacterial cause of gastroenteritis, encouraged the investigation of these infections by many laboratories but further understanding of them is dependent on the development of techniques which permit finer discrimination between strains than is at present available. The reappearance of dysentery due to Shigella sonnei after several years quiescence was noted by some laboratories. Among the environmental problems engaging the attention of a number of laboratories were the hygiene of hydrotherapy pools and sewage contamination of bathing beaches.

Most regional and some area laboratories provide reference facilities to support other PHLS and NHS laboratories. These include reference facilities for anthrax, hepatitis, toxoplasmosis, tuberculosis and others, of which those for hepatitis were heavily used.

Research and development

Nearly all the regional and area laboratories reported some research and development activity in progress or completed during the year. Many of the 403 projects were extensions of the routine work of the laboratory, such as surveys in collaboration with other PHLS laboratories, hospitals or university departments. Others were continuations of work begun in previous years. The projects may be broadly categorised as follows:

Research	77
Development of techniques	56
Evaluation of equipment or techniques	39
Surveys: clinical, epidemiological or other	171
Trials: antimicrobial, vaccines or other	31
Reference and special services (e.g. bacteriological evaluation of human milk banks)	9
Special applications of electron microscopy	11
Computer applications (including microcomputers)	9

These projects were supported in part by income from external sources - health authorities, the Medical Research Council, DHSS, industry and others - totalling £121 350, and also by permanent or temporary donations of equipment and by supply of reagents and diagnostic kits.

COMMUNICABLE DISEASE SURVEILLANCE CENTRE

(Director: Dr N S Galbraith)

During 1981 the Centre's epidemiologists took part in 36 major field investigations. Surveillance activities were improved by developments in the computerisation of laboratory data, by the use of a word-processor for the production of the Communicable Disease Report, the main information output of the Centre, and by two new surveillance projects in association with paediatricians for monitoring necrotising enterocolitis and Reye's syndrome. The training and teaching functions of the Centre were extended to include senior registrar microbiologists in the attachment scheme and a three-day introductory course in epidemiology for PHLS microbiologists. Nine half or whole day courses were provided for visiting community physicians, microbiologists and veterinarians, and there were 347 individual visitors during the year, 110 of them from overseas. Table 3 shows the number of staff employed in the Centre.

Field investigations

CDSC was established by PHLS to support and co-ordinate the work of Medical Officers for Environmental Health through the regional and area laboratories, so that one of the Centre's most important functions is to take part in field investigations of episodes of infection. Of those investigated in 1981, 12 were of food poisoning or gastro-intestinal illness, 10 of viral hepatitis and six of respiratory disease. Five of these investigations were worthy of particular mention because it is doubtful if any of them could have been undertaken by local community physicians without the national support provided by PHLS microbiologists and epidemiologists. A widely scattered outbreak of eight cases of paratyphoid B fever, all due to organisms of the same phage type, five of which were associated with a particular restaurant in the Algarve, Portugal, would not have been recognised without national surveillance of laboratory data. Another outbreak, of campylobacter infection, was reported to CDSC by a school medical officer taking part in a new surveillance scheme of illness in boarding schools organised jointly with the Medical Officers of Schools Association; this early reporting enabled swift and detailed epidemiological and laboratory studies which provided strong evidence that the infection was waterborne, the first waterborne campylobacter outbreak to be described in the United Kingdom.

Table 3 Numbers and grades of staff working in the Communicable Disease Surveillance Centre as at 31st March 1982 (in whole-time equivalents)

Consultants	5
Other Medical	1
Top Grade and Principal Microbiologists	-
Other Microbiologists	1
Technical Officers, Principal and Senior Chief MLSOs	-
Other MLSOs	1
Administrative and Clerical	22
Ancillary and others (i.e. Craftsmen)	-
Total	30

An outbreak of legionnaires' disease was also successfully investigated by deploying from CDSC epidemiological expertise not locally available to district departments of community medicine. Three cases were confirmed and there were three probable cases, all of which were shown to be associated with a particular cooling tower on a power station construction site; organisms of the same serotype were isolated from the cooling water and preventive measures were introduced. Epidemiological studies of Q fever in Gwent and listeriosis in Cumbria brought to light local outbreaks of these diseases, although the sources of infection were not identified; it is unlikely, however, that the extent of these episodes would have been recognised without these detailed epidemiological studies.

Communicable disease incidents often attract public interest and bring CDSC staff into contact with the news media. In 1981 a professional journalist in the DHSS Press Office was given special responsibility for the work of CDSC and this has proved of great value (see, for instance, page 41).

Special studies

The staff of CDSC have worked closely with the PHLS microbiologists and other colleagues in several special studies of communicable disease. These include salmonella infections in hospitals, typhoid and paratyphoid infections acquired in Britain, leptospirosis in agricultural workers, hepatitis A and immunoglobulin prophylaxis in travellers, tuberculin conversion after neonatal BCG, congenital toxoplasmosis in South East England, legionella contamination of cooling water systems, a study of pyogenic meningitis to detect primary amoebic meningoencephalitis and the relative value of the routine indices used for influenza surveillance.

Communicable disease, 1981

An annual review of communicable disease in England and Wales in 1981, a joint report by CDSC and the Office of Population, Censuses and Surveys, is in preparation. The following paragraphs summarize the most notable events of the year.

Anthrax Although there were no reported cases of anthrax in 1981, the disease received much publicity following the dumping in public places of samples of soil from Gruinard, the Scottish island heavily contaminated with anthrax spores. Although this action posed no serious public risk, it prompted questions about the current incidence of anthrax in Britain. Surveillance of human anthrax is maintained by laboratory reports, notifications under the Factories Acts, notifications under the Public Health Acts and registered deaths. Integration of these four sources of data at CDSC showed that the disease almost disappeared in recent years. Between 1961 and 1981 there were 145 reported cases and 12 deaths from anthrax in England and Wales but there was a decline from 56 cases in the five years 1961-5 to 14 cases in 1976-80. Of the 145 cases only 40 worked with wool or hides, industries traditionally associated with the disease, and of the remainder 32 worked in the meat trade, eight were farmers and in 23 there was a history of contact with bone meal.

Campylobacter infection In the year 1981 there were 12 496 laboratory reports of campylobacter infection, for the first time exceeding the number of salmonella infections (9532). The usual seasonal pattern of a summer peak was evident but the number of reports rose more steeply and to a higher level of over 400 per week than in previous years. There were seven outbreaks, comprising 213 cases, attributed to milk and one waterborne outbreak mentioned above, but the cause of the large increase in reported infections was obscure.

Cholera There were 10 cases of cholera reported in 1981, the highest annual total since re-importation of the disease began in 1970; five acquired the infection in Tunisia, three in Pakistan and one each in India and Iraq. All recovered uneventfully and there was no spread of infection.

Enterovirus infections Coxsackie B2 and B5 viruses were prevalent in the summer months and an outbreak of echovirus 17 took place in the latter half of the year. The most notable event was the report of two cases of paralytic illness in young children in Devon in December, occurring soon after the administration of their first doses of oral polio vaccine. Epidemiological investigations locally did not reveal evidence of an outbreak of neurotropic virus infection and national studies showed no rise in vaccine-associated disease. The cause of this episode remained uncertain; but the most likely explanation appeared to be the coincidental occurrence of two vaccine-associated cases of poliomyelitis.

Food poisoning The number of laboratory reports of bacterial food poisoning and salmonellosis was similar to that of 1980 (10 665 in 1981 compared with 10 856 in 1980). Salmonella typhimurium infections increased by 7% but infections due to other serotypes decreased by 4%; the overall number of infections was about the same. Reported general outbreaks decreased and hospital outbreaks declined to about half that of 1980, but family outbreaks and sporadic cases increased. There were seven outbreaks of scombrotoxin food poisoning and five of red kidney bean poisoning. Twenty-nine outbreaks of unknown aetiology were reported by Medical Officers for Environmental Health; nine were probably due to foodborne virus infection.

Viral hepatitis Statutory notifications of infective jaundice increased from 5143 in 1980 to 9841 in 1981, an increase attributed to a rise in hepatitis A infection. Most were in school children but in the second quarter of 1981 there was a peak of notifications in persons aged 25 years and over, coinciding with several outbreaks of foodborne hepatitis A due to cockles. This suggested that shellfish-associated disease may have been more widespread than the few identified outbreaks indicated. There were 1232 laboratory reports of acute hepatitis B virus infection in 1981, a slight increase on the average figure of 1048 for the years 1976-80. There were 75 cases reported in health service staff, also an increase on the average figure of 61 during the previous five years.

Influenza There was little influenza during the winter 1981-2. Outbreaks of influenza B in schools and old people's homes took place mainly in January and February 1982 and sporadic cases of influenza A were reported at the end of the winter and in the spring of 1982.

Lassa fever A case of Lassa fever in an 18-year-old Nigerian lady who had been living in Jos, Nigeria, was reported in December. She resided in Southwark and was admitted to St Thomas's Hospital before transfer to Coppetts Wood Hospital where she made a slow recovery. Over 170 contacts were placed under surveillance. This was the first confirmed case of Lassa fever in Britain since 1976. Although the disease is not now considered to be as infectious as originally feared and community spread is unlikely, hospital or laboratory spread by direct contact with infected blood or secretions remains an important risk and this episode necessitated many hospital contacts being placed under surveillance.

Legionnaires' disease There were 143 cases of legionnaires' disease reported in 1981 compared with 202 in the previous year. The characteristic seasonal peak in September and October was again apparent and the age and sex distributions of cases were similar to those in previous years; the average age for males was 52 years and for females 59 years. In 64 cases (45%) the infection appeared to have been acquired abroad. Three outbreaks were identified, two in holiday hotels abroad and one (already mentioned) at a power station construction site in Lancashire. One of the hotel outbreaks comprised five confirmed cases associated with a hotel in Italy. In both outbreaks the national health authorities were informed and control measures instituted.

Leptospirosis There were 43 reported cases of leptospirosis in England and Wales in 1981, 23 of which were formally notified, compared with 25 in 1980. The reason for this increase was not apparent. Of the 43 cases, 26 were due to organisms of icterohaemorrhagiae subgroup and 12 to the hebdomadis serogroup. There was a seasonal peak in the third quarter of the year and an excess of cases in males compared to females, 39 to 14, reflecting the association of the disease with occupations such as farming. A previously unrecognised risk in fish farmers was identified.

Listeriosis Laboratory reports of infection with Listeria monocytogenes numbered 86 in 1981 and included an unusual cluster of 11 cases in Cumbria, four of whom were pregnant women who transmitted the infection to their babies. Initial epidemiological investigations failed to reveal a common source of infection; subsequently a detailed case control study was undertaken but the results are not yet available.

Malaria For the second year in succession there was a fall in the number of cases of malaria reported to the PHLS Malaria Reference Laboratory, from 1670 in 1980 to 1576 in 1981. As in previous years most of the cases (1110) were Plasmodium vivax infections, 729 of which were known to have been acquired in the Indian sub-continent. There were 370 P. falciparum infections, nearly all of which (323) were acquired in Africa. There were two deaths reported, both of them due to P. falciparum malaria.

Rabies The death in Gloucester of a 23-year-old woman from rabies in August 1981 who had been bitten by a dog in India was followed by intense publicity about the disease. Requests to public health laboratories for post-exposure prophylaxis increased 10-fold in the months immediately following this episode. This was the 18th case of human rabies reported in the United Kingdom since 1900, 15 of them since the 1940s. Of these 15 cases, 12 acquired the disease in the Indian sub-continent, and one each in Gambia, Greece and Indonesia.

Smallpox vaccination Although the World Health Organisation officially declared the world free of smallpox in May 1980, some countries have continued to request valid certificates of vaccination against smallpox. Because of the hazards of vaccination, doctors confronted with a request for vaccination for travel have been advised to issue waiver letters. As expected, therefore, reported complications of vaccination have declined; there were 21 reports in 1979, nine in 1980 and only three in 1981.

Sexually transmitted diseases Attendances at STD clinics in the United Kingdom again increased, reaching 523 319 in 1981. Non-specific genital infection has shown the greatest increase in recent years of any diagnostic category; there were 132 391 new cases in 1981. The other notable feature of the year was the continued increase in gonorrhoea due to beta-lactamase-producing strains of Neisseria gonorrhoeae which more than doubled compared with 1980 to 443; furthermore, the proportion acquiring this infection in the United Kingdom increased from 34% in 1980 to 47% in 1981.

Toxic shock syndrome During 1980 staphylococcal toxic shock syndrome was described in the USA in otherwise healthy women associated with the use of tampons and since then over 1000 cases have been identified. The disease has, however, been very uncommon in Britain; until April 1982 surveillance by the PHLS Division of Hospital Infection had identified only 24 confirmed or probable cases of the disease associated with menstruation and another case associated with a post-partum breast abscess. The explanation for this difference between the USA and Britain is uncertain but may be due to different tampon usage.

Tuberculosis Notifications again declined in England and Wales: respiratory disease from 6673 in 1980 to 5860 in 1981 and non-respiratory disease from 2472 to 2269. A newly established system of laboratory reporting of mycobacteria has yet to be evaluated but, during the year, proved useful in identifying related cases and sources of infection. It is hoped that it will be possible to extend this reporting system to include all laboratories so that it can be used to monitor trends in sputum smear-positive cases of tuberculosis.

Typhoid and paratyphoid There were 197 reported cases of typhoid fever in 1981 compared with 230 in 1980, 24 of which contracted the disease in the United Kingdom. Of these 24 cases, 18 were contacts of excretors (15 of them in immigrant households), one was a sewage worker, one a nurse and two were probably infected by excretor food handlers; in two, no source of infection was discovered. There were 100 reported cases of paratyphoid fever in 1981 compared with 104 in 1980. Of 43 cases of paratyphoid A, only two were infected in the United Kingdom; both were contacts of cases. Of 57 cases of paratyphoid B, 12 were infected in the United Kingdom, one was a contact of a case, another was a nurse, but no source was discovered in the remaining 10.

Whooping cough In the first half of 1981, notifications of whooping cough remained at a high inter-epidemic level, averaging 269 per week, but increased in the second half of the year; laboratory reports of Bordetella pertussis followed this trend, portending another large outbreak of pertussis. Previous trends suggest the outbreak will reach its peak in the second half of 1982 and will continue into 1983.

CENTRAL PUBLIC HEALTH LABORATORY

(Director: Professor A A Glynn)

The year began with the start in earnest of the work on the New Colindale site. This, and the subsequent visible and rapid progress of the main structure, finally convinced most people that the new CPHL is really on the way (see Figures 3 and 4). The conviction is reinforced by the growing efforts being applied to plan the move and commissioning process and to update operational policies. Meanwhile to keep the balance, some renovation and redecoration at 'old' Colindale was carried out, there being still time enough to make it worthwhile. In the Tower Block a radioactive preparation room for general use was opened. Much of the lighting was brought up to modern standards and the overloaded electricity distribution system was upgraded.

With the departure of the Bacterial Metabolism Research Laboratory to CAMR in November 1981, it was at last possible to bring in the Quality Control Laboratory from their lonely outpost in Neasden. The future move of the Leptospira Laboratory to the PHLS Laboratory, Hereford, will give a little more room for manoeuvre. The number of staff employed in CPHL is shown in Table 4.

Modern microbiology draws heavily on biochemistry and immunology. The filling of a microbiological vacancy by a biochemist was a step in a policy designed to strengthen the CPHL's expertise in these fields.

Table 4 Numbers and grades of staff working in the Central Public Health Laboratory at 31st March 1982 (in whole-time equivalents)*

Consultants	13
Other Medical	7
Top Grade and Principal Microbiologists	20
Other Microbiologists	42
Technical Officers, Principal and Senior Chief MLSOs	11
Other MLSOs	55
Administrative and Clerical	57
Ancillary and others (i.e. Craftsmen)	86
Total	291

---

* Figures for the Bacterial Metabolism Research Laboratory have been included with CAMR.

Figure 3 Site clearance for the new Central Public Health Laboratory, Colindale, in May 1981.

Figure 4 Construction of the new Central Public Health Laboratory well under way, March 1982.

Education

The new programme of 4 o'clock lectures by outside experts and seminars by CPHL staff is going well. Although inevitably people listen most to subjects related to their own, the pattern of attendance suggests that there is some cross-fertilisation.

To strengthen educational links with the London School of Hygiene and Tropical Medicine, Professor Glynn has become a member of the committee for the MSc (Microbiology) course.

Administration

A new committee structure is wearing itself in. The periodic reviews of CPHL carried out jointly with the Headquarters Office have proved useful to both sides.

Science

No major changes in emphasis occurred during the year. A Scientific Review Committee of the Board visited the National Collection of Type Cultures in June 1981 (see page 26).

Central Library

(Chief Librarian: Miss Betty H Whyte)

The Library continues to provide a unique service to readers both within and outside the PHLS. At 44 000, transactions have doubled over the last 10 years, and this takes no account of the growth of the very significant interlaboratory circulation of journals outside Colindale. The *Library Bulletin* has a weekly circulation of just under 1000 copies, 56% of these being extramural and 20% going overseas.

Division of Enteric Pathogens

(Director: Dr B Rowe)

The computer system is now complete and records all *Salmonella*, *Shigella* and *Esherichia coli* strains received. Its use, together with close collaboration with CDSC, has increased the efficiency of surveillance and analysis of these bacteria and the infections they cause.

Serotyping and phage typing systems for fine identification are continuously being improved. New serotypes of *Salmonella*, *Shigella*, *E. coli* and *Citrobacter koseri* have been characterised, a phage typing scheme for *S. heidelberg* has been completed and schemes for *S. newport* and *S. virchow* are being developed.

Monitoring resistance to antimicrobial drugs among various groups of intestinal bacteria continues. Since 1947 a remarkable rise in the incidence of drug resistance among *Shigella* strains belonging to subgroups A, B and C has occurred in Britain. The origins, relationships and epidemiology of epidemic, multiply antibiotic-resistant *Salmonella*, *Shigella* and *Vibrio cholerae* were studied. Of particular interest were strains of *S. typhimurium* which originally spread among farm animals in Britain and subsequently caused numerous human infections, *Sh. dysenteriae* 1 which caused a widespread epidemic in Central Africa and *V. cholerae* El Tor from outbreaks in Bangladesh.

Studies of the enterotoxins and adhesive properties of E. coli strains that cause diarrhoea continue to be an important activity. New methods for the detection of enterotoxins have been compared as part of a World Health Organisation collaborative study and new adhesive factors have been recognised. The genetic control of enterotoxin and adhesive factor production are being studied and the results may be valuable in the development of vaccine strains for the control of E. coli enteritis.

Visiting workers from 10 overseas countries were accommodated in the Division for periods of a week or more.

Division of Hospital Infection

(Acting Director: Dr R R Marples)

Staphylococci After several years of decline, phage typing of Staphylococcus aureus increased in 1981 by nearly 20% to over 10 000 isolates tested. Additional tests, e.g. reverse typing and heat shock, were introduced as needed. The epidermolytic toxin responsible for the 'scalded skin' manifestations of some staphylococcal infections is now tested for routinely.

Strains from suspected cases of 'toxic shock syndrome' and other serious infections are being studied in collaboration with the Food Hygiene Laboratory, Colindale, and Professor Arbuthnott's department in Trinity College, Dublin. Preliminary work on the detection of possible toxin-related proteins has started.

The number of requests for the identification and characterisation of coagulase-negative staphylococci has risen owing to increased awareness of the pathogenicity of these organisms in prosthetic surgery and the introduction of new techniques such as ambulatory peritoneal dialysis. Taxonomic studies on 300 selected strains have been completed.

Surveys of resistance to antibiotics of clinically significant isolates and of isolates from the skin have shown changes in the frequency of aminoglycoside resistance. The genetics of mechanisms of resistance to aminoglycoside antibiotics in Staph. epidermidis and Staph. aureus are being compared. A study of the beta-lactamases (enzymes capable of inactivating penicillin and related antibiotics) found in coagulase-negative staphylococci is being undertaken.

Studies on normal skin flora include an examination of different prophylactic treatments on colonisation of newborn infants by Staph. aureus in order to find a replacement for hexachlorophane, which is no longer available.

International collaboration on phage typing of Staph. aureus gives information on strain variability and controls the performance of laboratories. However, a survey of phage typing of coagulase-negative staphylococci showed very poor reproducibility of typing patterns.

Streptococci About one-third of the streptococci referred to the Division as having been isolated from cases of serious disease are not representative of the well defined pathogenic species and are sent for identification. For group A streptococci three typing systems depending on T, M and OF antigens are in use. The proportion of typable strains is increasing with the development of new typing sera by the laboratory. The system proved its value in the recent investigation of an outbreak of skin sepsis among workers in abattoirs and meat factories. The 14 strains typed out of 19 tested included eight new types recognised at Colindale within recent years.

The sero-phage typing system developed for group B streptococci was used in a PHLS-organised survey of group B infection in the newborn and in collaborative projects with hospital and university laboratories. Typing of strains demonstrated that there are different sources of the group B streptococcal infection in the newborn. Typing schemes for group C and group G streptococci are also being developed.

The number of strains of Strep. pneumoniae referred for typing has doubled in recent years. There has, however, been no major change in the distribution of types causing serious disease.

Gram-negative bacilli The level of demand for routine typing of isolates from outbreaks of infection in hospital with Pseudomonas aeruginosa and Serratia marcescens was similar to previous years. Hospital infection problems with Ps. cepacia, Proteus mirabilis and Serr. liquefaciens were investigated.

A survey at Northwick Park Hospital showed that patients who had undergone endotracheal intubation were colonised with Ps. aeruginosa more rapidly than those who had not. The strains did not come from the gut and there was little evidence of cross-infection.

A study of resistance of Ps. aeruginosa to a new cephalosporin, cefsulodin, was completed with the PHLS laboratory, Oxford.

Methods of measuring antibodies to Ps. aeruginosa are being assessed.

Other studies The data collected in 1980 in the National Prevalence Survey of Hospital-acquired Infection have been studied further in relation to the organisms implicated in the infections and the wide scope of staphylococcal hospital-acquired infection documented.

The Division was closely concerned in the survey of contamination in first-aid dressings (see page 37).

Visitors During the year there have been 12 working visitors who have stayed for more than one week.

Division of Microbiological Reagents and Quality Control

(Director: Dr P S Gardner)

The move of the quality assessment activities of the Division from Neasden to the Colindale site has enabled the bacteriology section also to be re-housed; the reagents and virology sections and part of the administration continue to be accommodated in the old building. The quantities of viral and bacterial reagents issued during the year were as follows:

Antigens	102 907 ml (of which 22 784 ml were for non-PHLS laboratories)
Antisera	39 973 ml (of which 11 562 ml were for non-PHLS laboratories)
'Hepatest'	294 000 tests

This is the first year during which there were accurate computerised records. It is uncertain whether the use of reagents has decreased, but to ensure that they are used to good effect a policy of rationalising their use has been pursued.

'Hepatest', antisera and conjugates for the fluorescent antibody technique and the occasional batch of rubella haemagglutinating antigen are the only reagents bought from commercial sources; their quality is rigorously assessed before purchase, so improving the standard of diagnostic reagents in use.

The Division is a WHO Reference Centre for rapid virus diagnosis and receives specimens from all over the world in this connection. Other diagnostic tests performed included 627 sera for antibody to Legionella pneumophila.

During the year 3907 ampoules of Kveim antigen for skin tests for sarcoidosis were issued, the material having been prepared for use at CAMR.

Quality assessment Five hundred and forty-two laboratories now take part in the quality assessment scheme of which 415 are in the UK. One hundred specimens were sent out in 31 distributions among which were more for virology. This is a difficult subject and more laboratories are requiring this service; the original scheme did not cater for it and its cost has not favoured its development. Nevertheless, all branches of the subject, including tissue culture, serology, hepatitis, rubella and electron microscopy have been assessed.

The Division intends to build up reference reagents wherever necessary; the two for rubella issued this year have been for radial haemolysis and for haemagglutination inhibition. The annual panel of hepatitis specimens continues to be prepared and issued to all hepatitis diagnostic laboratories requesting it.

A start has been made on quality assessment of media issued centrally to PHLS laboratories.

Developments A successful ELISA system for hepatitis B 'e' antigen and antibody has been devised which has been tested in three diagnostic laboratories. The source materials of human origin were kindly supplied by the Department of Virology, Middlesex Hospital Medical School.

Progress too has been made in detection of hepatitis A-specific IgM. An ELISA kit has been produced in collaboration with Organon Ltd, and will shortly be the subject of a field trial.

ELISA is also being developed for the detection of rotaviruses in faeces.

A monoclonal antibody to cytomegalovirus (CMV) has been produced and a number of clones produced at CAMR are now held by the Division. The development of an anti-mu capture system for specific CMV IgM detection for the early recognition of infection by this virus is well under way.

The monoclonal antibody already developed against adenovirus type 5 has been further characterised and adenovirus type 3 monoclonal antibodies are also being prepared.

Methods for improving the specificity of the reverse passive haemagglutination tests for detection of hepatitis surface antigen has been developed in conjunction with with the Wellcome Foundation Ltd and the results published.

A micro-test for the detection of rubella IgG antibody by passive haemolysis in free solution has been devised, which is reproducible, sensitive, simple to perform and economical in the use of reagents.

The need for a complete reassessment of all standard viral antisera prepared over the years has led to the evaluation of a micro-neutralising technique which is simple and cheap. After validation this method will be recommended to the PHLS.

The Division is also engaged in improving bacterial diagnosis. One example is the demonstration of the indirect fluorescent antibody technique for Salmonella typhi Vi antibody in enteric infections.

Interest in legionellosis continues. In addition to the indirect fluorescent antibody technique, a rapid micro-agglutination test has been developed, the reagents for which are now available for issue.

The Division still receives several requests each year for serological tests for listeriosis, especially concerning cases of abortion. An indirect fluorescent antibody method seems to be both sensitive and specific and is currently under evaluation. Collaboration with Professor Audurier in Tours, France, using strains of Listeria monocytogenes collected in the Division during the past 14 years, has established that his phage typing system for L. monocytogenes gives reproducible results and discriminates well. Cross-infections between hospital patients and between neonates have been demonstrated for the first time. The laboratory is now involved in a multicentre international study under the auspices of the International Sub-committee for the Taxonomy of Listeria and Related Bacteria to recommend a set of phages for international use.

Visitors Three overseas visitors worked in the Division for a week or longer during this year.

Epidemiological Research Laboratory

(Director: Dr T M Pollock)

For some years the laboratory has been collecting data to improve assessment of the efficacy and safety of pertussis vaccine. The national study just completed shows that the vaccine confers about 80% protection against severe disease, tends to ameliorate those attacks which do occur and reduces the spread of Bordetella pertussis. However, it does not always protect against spread from close household contacts.

The study of reactions to vaccines in the North-West Thames Region has been completed. Febrile convulsions may follow DTP vaccine, but this is a rare event. There is evidence of bias in reporting in that febrile convulsions following DT are less likely to be associated with the vaccine than those following DTP. The incidents of serious brain damage which were reported could not conclusively be associated with the vaccine.

The detailed follow-up of 10 000 children given three doses of either DTP or DT in Hertfordshire has now been completed and the findings are being analysed.

Annual surveillance of BCG vaccine continues and the relationship between the viable count of BCG given, local reaction to BCG and sensitivity to tuberculin is being studied.

The measles vaccine trial is in its 16th year and a report has been prepared. A study of reactions to two measles vaccines has been started.

The hepatitis B protection programme remains effective. The survey of dialysis units continues.

The study, with the Influenza Research Unit at the PHLS Laboratory, Guildford, of influenza in residential schools is in its second year.

The prevalence of antibodies to poliovirus and to rubella is being determined. The response and reaction to two rubella vaccines is being examined, in collaboration with the National Institute for Biological Standards and Control.

Several studies on the usage of immunoglobulins are in progress. The ability of a reduced dosage of immunoglobulin to prevent hepatitis A in short-stay travellers is being monitored. A study of prevention of influenza is planned. A single dose of hepatitis B immunoglobulin has a failure rate of approximately 1%; information on the value of two doses is accumulating. Zoster immunoglobulin does not prevent chicken pox but may reduce its severity.

Food Hygiene Laboratory

(Director: Dr R J Gilbert)

Routine examination of foods Samples of a wide variety of products were received from the Port of London and Heathrow Airport under the Imported Food Regulations, from local authorities and from DHSS, usually as a result of food poisoning or spoilage problems, e.g. canned salmon (USA), canned tomatoes (Italy) and canned sardines (Morocco).

Reference facilities A national typing and toxin testing service for PHLS and hospital laboratories throughout the UK was provided for the confirmation of Bacillus cereus and other Bacillus spp., Clostridium botulinum, Cl. perfringens and Staphylococcus aureus: cultures were also received from many laboratories overseas. Most of the cultures, clinical specimens and food samples tested were from food poisoning outbreaks. However, an increasing number of cultures came from non-gastrointestinal sources such as contaminated wound dressings (Bacillus spp.), wound infections (B. cereus) and cases of toxic shock syndrome (Staph. aureus).

Information and education The laboratory received many requests from government departments (DHSS, MAFF), national organisations (British Standards Institution, Environmental Health Officers' Association) and international organisations (WHO, Codex Alimentarius, International Standards Organisation, EEC) for advice and information on various aspects of food microbiology, food hygiene, standards and specifications.

More than 50 workers from 22 countries visited the laboratory, and 45 lectures or papers were presented at postgraduate teaching courses and meetings and conferences in the UK and overseas (Eire, Finland, Japan, Netherlands).

Research and development An active research programme was maintained covering a range of projects including surveys on the incidence of specific pathogens (Campylobacter, Salmonella, Yersinia enterocolitica) in foods; the growth and recovery of pathogens (Staph. aureus, Streptococcus, Vibrio cholerae) from foods; mechanisms of pathogenicity (B. cereus); the purification of bacterial enterotoxins (Cl. perfringens); the development of ELISA and tissue culture techniques; and the development of serological and bacteriocin typing schemes.

Leptospira Reference Laboratory

(Director: Dr Joyce D Coghlan until 6th December 1981; Dr Sheena Waitkins from 7th December 1981)

Seventy-two cases of leptospirosis (seven fatal) were confirmed by the laboratory during 1981, an increase over the previous two years (55 cases in 1979; 48 cases in 1980). Twenty-five per cent of recorded cases were infections by the hebdomadis serogroup and most were in the farming community. The incidence of this infection within the farming industry is being monitored by a recently established working group. Leptospiral infections among trout farmers are also currently under scrutiny.

The laboratory is a WHO Collaborating Centre for Research and Reference on Leptospirosis. During 1981, strains from Kenya, Kuwait, the USSR and the Netherlands were received for characterisation.

Recent published work on the separation of antigens by fractionation on sucrose density gradients has enabled genus-specific, group-specific and type-specific antigenic fractions to be identified.

National Collection of Type Cultures

(Curator: Dr L R Hill)

The Collection supplied 7145 cultures of which 26% were sent abroad. This is an 11% decrease on the previous year, resulting from increased charges for cultures from 1st August 1981 and the adoption of a 'cash with order' system.

In the freeze-drying section, 97 015 ampoules and vials (71% for DMRQC) and 680 faecal specimens were processed for the Bacterial Metabolism Research Laboratory. The National Collection of Type Cultures' (NCTC) small freeze-dryer for Category B organisms became operational. Large freeze-dryers had to be used most weekends for work from DMRQC because one of their machines had been rendered inoperative following the use of sodium azide. NCTC is collaborating with DHSS on this technical problem.

The 860 strains identified represent a decrease on the previous year, due to 'vetting' of incoming strains to ensure more rapid revision of identification matrices. Identification programmes and unrevised matrices have been transferred to the CPHL computer.

The 60 strains taken into the Collection included *Campylobacter* spp. and a set of reference strains for serology of *Pseudomonas aeuginosa*.

Research The classification of campylobacters is being undertaken, using DNA (%GC, genome sizes, *in vitro* molecular hybridization), GLC and protein pattern parameters. About 20% of miscellaneous strains sent to NCTC for identification are coryneforms, and very difficult to identify. Research on their classification is directed towards cell wall compositions, DNA parameters and protein patterns. Three major groups are recognised from the cell walls: *C. diphtheriae* and like spp., *Brevibacterium* spp., *C. bovis* and *C. aquaticum*. Work has recently begun on *C. haemolyticum*. *Ps. paucimobilis*, which occurs in hospital water supplies and other damp environments, has been compared with other yellow-pigmented bacteria with which it may easily be confused. Good correlation was found between DNA characteristics and protein patterns.

NCTC acts informally as a reference centre for bacteria of the *Flavobacteria* and *Capnocytophaga* groups. Descriptions of two new species have been prepared.

New matrices intended for use in the identification of fermenting and non-fermenting Gram-negative organisms have been devised and are ready to be entered in the CPHL computer.

Scientific review The laboratory was visited by a Scientific Review Committee of the Board under the Chairmanship of Dr T H Flewett in June 1981. The Committee commended the Curator and staff of the Collection on the work accomplished and in progress and made several recommendations on general policy, including a possible future role as the nucleus of a biochemistry unit for the Central Public Health Laboratory.

Visitors There were two visiting workers who stayed for more than one week and a further 16 visitors who came for one to two days.

Virus Reference Laboratory

(Director: Dr Marguerite S Pereira)

Work is in progress on the possible aetiological role of the Epstein-Barr (EB) virus in rheumatoid arthritis and on the incidence of EB-related nasopharyngeal carcinoma in the UK. Altered T cell immune responses can be demonstrated by EB virus stimulation of peripheral blood cells of patients with rheumatoid arthritis and in those with immunodeficiency or receiving transplants.

Antibody studies against a variety of enteroviruses include collaboration with the Epidemiological Research Laboratory on the reponse to polio vaccination in children and with the National Institute of

Biological Standards and Control on the evaluation of monoclonal antibodies.

Investigations, with the Food Hygiene Laboratory, of several further food-associated outbreaks of non-bacterial gastroenteritis have confirmed the role played by viruses. Several as yet unclassified small viruses seem to be implicated. Attempts are being made to characterize them by morphological and biochemical procedures.

Production of a monoclonal antibody to hepatitis A virus has allowed the development of a sensitive radio-immunoassay for hepatitis A IgM antibody, so improving diagnosis of acute infections. The test has increased the need for a regular and abundant source of antigen and a promising tissue culture system is being developed.

UK experience of influenza virus in the years 1976-81 has been analysed. Monoclonal antibodies for the antigenic analysis of influenza viruses are being developed.

Epidemiological studies on the excretion of polyoma viruses continue and several new viruses are being examined by restriction enzyme analysis. Molecular cloning of prototype strains is being carried out in collaboration with CAMR.

Radio-immunoassay for rabies antibody is proving sensitive, reproducible and easier to do than previous assays.

An IgM capture assay for rubella antibody has been developed. A study to compare responses to two rubella vaccines is being supported by the DHSS and the Medical Research Council.

The electron microscopy unit is, with the Division of Enteric Pathogens, engaged in studies of antigens and adhesion in *Escherichia coli* and is examining the papovaviruses.

An exciting finding has been the demonstration of particles closely resembling hepatitis B core particles in a strain of *E. coli* into which genetic material from hepatitis B virus had been inserted by genetic manipulation in Dr K Murray's laboratory in Edinburgh.

There were seven visiting workers during the year, five of them from overseas.

CENTRE FOR APPLIED MICROBIOLOGY AND RESEARCH

(Director: Dr P M Sutton)

Introduction

The third year of the existence of CAMR saw some notable changes. Chief among these were the formation of the Microbial Technology Laboratory from the Microbial Products Development and Production and the Diagnostic Reagents Laboratories in April 1981, the transfer of the Bacterial Metabolism Research Laboratories from Colindale in February 1982, the renaming of the Genetic Manipulation Laboratory as the Molecular Genetics Laboratory, and the setting up of CAMR Works Services in April 1981 to replace the facilities of the Property Services Agency.

Two further grants were made by the Medical Research Council, bringing their total annual grant to £140 000. Although not a direct grant to CAMR, satisfactory arrangements have also been agreed with DHSS for collaborative support in clinical biochemistry; this is of considerable importance in the development and commercial exploitation of diagnostic reagents.

The provision by Immuno Limited of facilities has allowed production of vaccine against tick-borne encephalitis to be resumed. The production for KabiVitrum of human growth hormone from genetically engineered bacteria has proceeded satisfactorily and long-term production as the primary source of the hormone for the UK is under discussion. Negotiations are nearing completion for a further major genetic engineering project; licensing agreements for a diagnostic reagent and a process for protein purification are being discussed.

As noted elsewhere, sales of asparaginase have continued at an increased level although well within CAMR production capacity. The completion of improved facilities for therapeutic enzyme purification and for extraction of hormones from pituitary glands will allow expansion of work in both areas prior to the building of the new Production Centre. Approval of detailed plans for the latter augurs well for production of fully processed therapeutic drugs and vaccines for clinical trials, or limited production runs, from the planned completion date in 1984. Commercial enquiries continue at an encouraging level and a number of new patent applications have been lodged. A summary of the staff employed and of income (estimated receipts for the financial year 1981/2) are given in Tables 5 and 6.

Table 5 Numbers and grades of staff working in the Centre for Applied Microbiology and Research at 31st March 1982 (in whole-time equivalents)

Consultants	4
Other Medical	1
Top Grade and Principal Microbiologists	27
Other Microbiologists	61
Technical Officers, Principal and Senior MLSOs	5
Other MLSOs	57
Administrative and Clerical	31
Ancillary and others (i.e. Craftsmen)	137
Total	323

Table 6 Provisional summary of income for the Centre for Applied Microbiology and Research, 1981/2

	£000
Research and development projects	
Public bodies	179
Industry	16
Receipts from sale of products	
to DHSS and NHS	244
to others	704
Royalties and miscellaneous	1
Payment of services and facilities	203
Subtotal	1347
DHSS Chief Scientist's Office (research programmes)	709
Total	2056

Bacterial Metabolism Research Laboratory

(Director: Dr M J Hill)

The laboratory was transferred from a rather substandard annexe of the Central Public Health Laboratory in the grounds of Colindale Hospital to newly prepared accommodation in CAMR in November 1981. Although this caused a little disruption, the laboratory's programme of work has progressed satisfactorily along previously established lines.

Further study of the role in the genesis of gastric carcinoma of N-nitroso compounds formed from nitrate by the gastric bacterial flora has shown that the risk for the general population of the UK is not great, though this may not be true of those suffering from gastric achlorhydria. Work has continued on the possible action of the bacterial metabolites of bile acids as causes of colorectal cancer, in the form of prospective studies designed to investigate the effect of diet on faecal analyses and the microbial ecology of the colon in high-risk groups of patients.

The work on the identification of Legionella pneumophila has developed to the point that it can now be identified by gas chromatography with high precision, from a single colony.

Microbial Technology Laboratory

(Director: Professor A Atkinson)

This new laboratory which continues much of the work done in its two predecessors is divided into four sections dealing with microbiology and genetics, protein research and its application, fermentation technology and pilot plant production.

The scale-up of the production of genetically engineered human growth hormone (hGH), commissioned by KabiVitrum, has progressed to the 400 litre fermenter stage. From the cell paste produced, hGH was purified by KabiVitrum for clinical trials.

Enzymatic assay system for paracetamol The work on the development of a rapid, enzyme-based assay for paracetamol is now almost completed. A preliminary trial has shown it to give accurate, precise and reproducible results. A further trial, currently under way in collaboration with the MRC Clinical Research Centre and other hospitals, is funded by the National Enterprise Board (now the British Technology Group). Preliminary results from this latter trial have also been promising. Final patent specifications have been filed world-wide, and negotiations are in progress with commercial concerns to license the assay system, with a view to marketing it shortly as a diagnostic kit.

Similar studies on several other drugs are also in progress.

Protein separation system The two chromatographic techniques, high performance liquid chromatography (HPLC) and affinity chromatography (AC), have recently been combined to form a new procedure called high performance liquid affinity chromatography (HPLAC). HPLAC combines the speed and resolving power of HPLC with the biological specificity of AC. Patents have been filed, and discussions are in hand with a major firm.

The enzyme carboxypeptidase G2, produced by a variant of Pseudomonas, shows promise as a chemotherapeutic drug for methotrexate rescue when the latter is used in the treatment of some forms of cancer. As yields of the enzyme are reduced by an intracellular inhibitor, the gene coding for the enzyme has been cloned into an alternative host (Escherichia coli) to allow improved production. This manoeuvre is one of the earliest examples of a chromosomal Pseudomonas gene being expressed in E. coli.

In collaboration with workers from University College London, two new fibrinolytic enzymes have been purified and characterised from the tissue culture fluid of two established lines of epithelial cells derived from biopsies of non-malignant tissues. Both enzymes are plasminogen activators, but one has also some inherent (i.e. plasmin-independent) ability to digest fibrin. Patents have been taken out for these enzymes, and negotiations for their development begun with a British pharmaceutical firm.

During routine purification of glycerokinase from Bacillus stearothermophilus a second activity was detected which proved to be a previously undescribed hexokinase. This enzyme is highly and specifically active against glucose compared to other hexose sugars and may prove to be a useful new diagnostic reagent.

After experiments on the oxygen requirements of Staphylococcus aureus in 3 and 10 litre fermenters, the addition of carbon dioxide was found to increase substantially the yield of the valuable laboratory reagent, staphylococcal nuclease, and the process has now been scaled-up to a 150 litre fermenter. Staph. aureus protein A is useful in various immunological assays and experiments are in progress to improve both the reproducibility and the yield of the protein by cloning the relevant gene into an E. coli host. Large-scale affinity procedures have also been developed for isolation of protein A in 100 mg quantities.

Microbiological Safety Reference Laboratory

(Director: Dr A E Wright)

The examination of medical and scientific equipment continues, particularly of centrifuges. Interest in air sampling has increased as new clean air rooms are being constructed for the production of therapeutic substances. The laboratory continues to advise on and conduct the tests needed to assess the effectiveness of the high containment units used for the diagnosis of disease due to very dangerous pathogens in various laboratories in the UK.

The effect of formalin fumigation on safety cabinets, on HEPA filters, and also on electronic equipment incorporated into multi-channel autoanalysers, has also been studied.

The Safety Officer and other members of the staff of the Microbiological Safety Reference Laboratory have participated in laboratory inspections by the Ministry of Agriculture, Fisheries and Food and WHO as well as in visits by Health and Safety Executives and Genetic Manipulation Advisory Groups. The increasing importance of the medicinal substances currently being manufactured in the Centre (enzymes, hormones and vaccines) resulted in the appointment of a full-time Quality Controller to the staff of the laboratory.

Molecular Genetics Laboratory

(Director: Dr P J Greenaway)

The structure and function of the human cytomegalovirus (HCMV) genome was examined. Restriction endonuclease studies have enabled a composite physical map of the entire virus genome to be constructed, and a functional analysis of the HCMV genome is being carried out. The polypeptides present in purified HCMV preparations and the pattern of protein synthesis in HCMV-infected cells are being analysed, and monoclonal antibodies against various antigens produced late in infection have been prepared for development as diagnostic reagents.

Studies are proceeding on the molecular biology of variola major virus (using completely non-infectious material), seeking the genes involved in virulence, and to find structural homologies between other orthopoxvirus genomes.

The A and B subunits of the cholera toxin have been cloned separately into Esherichia coli and also into non-toxogenic Vibrio cholerae, as a preliminary to the development of an improved vaccine.

Pathogenic Microbes Research Laboratory

(Director: Professor D C Ellwood)

Work on an improved whooping cough vaccine continued.

The haemagglutinin previously thought to be fimbrial is now better referred to as filamentous haemagglutinin (FHA). The other major protective antigen, the outer membrane protein (OMP), is obtained by detergent extraction and has been shown to be a mixture of proteins. These OMP preparations possess histamine-sensitising and lymphocytosis-promoting (LPF) factors and there is a strong correlation between LPF content and mouse protective activity, though, by itself, LPF is toxic to mice and non-protective. The experimental 'cocktail' subunit vaccine of FHA and OMP (in varying proportions) has been examined at the National Institute for Biological Standards and Control, where its protective potency has been confirmed. Further studies are under way to compare the toxicity of this cocktail with standard commercial vaccines.

Pulmonary legionnaires' disease (LD) has been produced in an animal for the first time. Guinea-pigs, marmosets and rhesus monkeys were infected with small particle aerosols of Legionella pneumophila. A fibrinopurulent bronchopneumonia was produced similar to that seen in human disease. These animal models are now being used for studies on the pathogenesis, immunology and treatment of LD.

The mode of action of antimicrobial agents used in preventive dentistry was investigated. This included the effects of fluoride on acid production by bacterial populations (from plaque), the influence of pH on the action of fluoride, and the bacteriostatic properties of chlorhexidine used as a mouth-wash.

The phenotypic expression of oral streptococci grown in different environments (e.g. by varying the concentration of sodium and potassium ions) has shown that apparently weakly acid-producing streptococcal strains can produce as much acid as Streptococcus mutans, and hence may be cariogenic under some environmental conditions in dental plaque. Polysaccharide synthesis in oral streptococci may also be important in this connection by enabling bacteria to produce acid in the absence of exogenous fermentable carbohydrates.

The effect of nutritional limitation on the growth and virulence of Neisseria gonorrhoeae in chemostat culture has been investigated and the plasmids responsible for beta-lactamase production have been studied. Plasmid stability in continuous cultures of Escherichia coli, and methods of stabilising the unstable ones, have been examined.

Special Pathogens Reference Laboratory

(Director: Professor D I H Simpson)

During the year, 271 specimens were received from 194 patients in the UK and overseas for the diagnosis of viral haemorrhagic fever. Virus isolation was attempted from 73 specimens and 221 were examined for antibodies. One isolation of Lassa virus was made from an 18-year-old Nigerian woman, admitted with a febrile illness to a London teaching hospital and later transferred to Coppetts Wood Hospital. Cultures of blood were positive for the virus of Lassa fever, which was also isolated from urine. Renal excretion of the virus continued for the next eight weeks, despite the presence of circulating antibodies. The patient made a slow but complete recovery. Sera from 160 contacts were all negative for Lassa fever antibodies and there were no secondary cases.

Research has continued on the biological characterisation of the Lassa-like arenaviruses. It has been shown that beta-propiolactone, at levels of 0.2-0.3% in body fluids, provides a means of inactivating Lassa virus whilst not interfering with biochemical assays (urea, electrolytes, etc.) though Lassa virus so treated is still immunogenic in laboratory animals. A study of the biochemistry of concentrated Lassa virus has been made, and the virus-specific proteins of the capsid analysed.

Four hundred and ninety-eight specimens were received during the year for arbovirus serology, and antibodies were detected in 90. A collaborative programme has been set up with the Arbovirus Research Unit of the London School of Hygiene and Tropical Medicine, using monoclonal antibodies to a variety of viral proteins.

One hundred and fifty requests for serological examinations for rickettsial antibodies resulted in four seropositives for spotted fever (probably Rickettsia conorii) and two for typhus (probably R. mooseri).

Therapeutic Products Laboratory

(Director: Dr H E Wade)

The purification of the anti-leukaemic enzyme asparaginase remains a major commitment; 325 mega-units were freeze-dried and supplied to hospitals (30% to the UK, 50% to the USA and 20% to other overseas hospitals). At the request of the Federal Drugs Administration, alterations have been made to the safety testing of the drug; its shelf-life has also been increased from two to three years.

Glutaminase is still required for evaluation as an anti-cancer agent. The problem of a contaminating protease digesting the compound has been overcome by a combination of strain-selection for a higher producing Achromobacter with the use of ethylene diamine tetra-acetate in the process. A large-scale continuous culture at the FPP produced 3.4 mega-units of pure glutaminase, one-third of which has been supplied to the USA for clinical studies.

There are indications that methioninase could be specifically antagonistic to leukaemic cells. The enzyme has been extracted from cultures of Clostridium sporogenes, but the yield is low (5%). To be economic any large-scale production will require a different microbial source, so a screening programme has been designed to find a new bacterial sources of the enzyme.

The MRC Toxicology Unit is continuing to evaluate the efficacy of phenylalanine ammonia lyase (PAL) in the oral treatment of patients suffering from phenylketonuria. Previous efforts to protect the enzyme from proteolytic attack in the gut by chemical means have been unsuccessful. A new approach, exploiting the yeast cell wall itself to protect against digestion in the small intestine, has been tried. The original production strain of Rhodosporidium was too fragile, and a yeast with a tougher cell wall was selected. This allows PAL to survive in the gastro-intestinal tract long enough for the enzyme to convert the free phenylalanine in the intestinal fluid cinnamate. Further work on more productive strains continues.

During the year April 1981 to March 1982, CAMR received 17 334 acetone-treated and 13 621 frozen pituitary glands. Human growth hormone (hGH) is produced from acetone-treated pituitaries in two stages. In the first, low molecular weight peptides and glycoproteins are extracted from minced glands to yield a powder; in the second, hGH is extracted from this powder with alkali and purified to give a monomer preparation.

The glycoprotein side-fraction goes mainly to the Birmingham and Midland Hospital for Women, for study of the follicle-stimulating hormone. The low molecular weight peptides are sent to the National Institute for Biological Standards and Control, Hampstead, and to the National Institute for Medical Research, Mill Hill.

Last year 622 000 immunological units of hGH were produced, compared with 262 000 units the previous year.

Vaccine Research and Production Laboratory

(Director: Professor J Melling)

Seventeen batches of acetone-extracted subunit vaccine, derived from herpes simplex virus (HSV) type 1, were produced in 1981. In collaboration with Birmingham University, this vaccine was used on a 'named patient' basis to immunise either patients with genital HSV-2 infections or their 'at risk' consorts. Initial results are sufficiently encouraging to justify application for a Clinical Trials Certificate.

Production of the killed tick-borne encephalitis (TBE) virus concentrate, which is the basis of the vaccine marketed by Immuno AG of Austria, has begun. In collaboration with the Microbial Technology Laboratory work has been started on cloning the protective antigen of TBE virus.

OTHER REFERENCE LABORATORIES AND UNITS

Anaerobe Reference Unit, Luton

(Director: Dr A T Willis)

The unit received 580 reference specimens during the year. The anaerobes were identified by a battery of biochemical tests, antibiotic sensitivities and by gas-liquid chromatography of metabolic end-products.

In addition the unit was involved in the identification of anaerobes isolated during the PHLS survey of first-aid dressings (page 37), and in identification and toxin testing of many strains of Clostridium difficile from an 'outbreak' in St Albans.

Malaria Reference Laboratory

(Co-Directors: Professor D J Bradley and Professor W Peters)

In the year ending 31st March 1982, 1018 slides were received for diagnosis. More than 500 further cases were documented by writing to hospitals and general practitioners for details of cases of malaria they had notified. Over 400 sera were tested for antibody to malaria and other parasites. Although the total number of cases of malaria imported into the UK had dropped, the number of requests for advice on overseas travel had increased; in 1980 these were running at about 25 enquiries per day.

During the year further evidence developed in Kenya and Tanzania of chloroquine resistance in Plasmodium falciparum and there have been some reports of resistance to Maloprim and Fansidar. So far there is no conclusive evidence of resistance to chloroquine in West Africa.

Mycobacterium Reference Unit

(Director: Dr P A Jenkins)

The unit received 3308 cultures referred by laboratories throughout England. Of these, 2563 were Mycobacterium tuberculosis, all of which were tested for sensitivity to streptomycin, isoniazid, rifampicin and ethambutol. If resistance to one or more of these was detected, an extended range of drugs was tested. There were 83 strains of M. bovis and 32 of BCG, the latter arising in abscesses following vaccination. The remaining 620 strains were opportunist mycobacteria which were identified as far as was clinically necessary and sensitivity tests made on those that were thought to be significant.

The national drug resistance register received 206 notifications of initial resistance. Most of the strains (192) were resistant to one or both of streptomycin and isoniazid, and nearly three-quarters of them were from patients from the Indian subcontinent. Resistance to rifampicin was detected in 11 strains, but in nine cases this had been acquired abroad. The importance of monitoring the incidence of initial resistance, particularly to rifampicin, is stressed, as this drug forms the basis of modern short course regimens for the treatment of tuberculosis.

Mycological Reference Laboratory

(Director: Professor D W R Mackenzie)

During this year 2719 sera were examined for serological evidence of serious fungal infections, 1285 cultures of fungi were identified, 95 sets of tissue sections were examined for the presence of pathogenic fungi and 450 assays for sensitivity to, or blood levels of, antifungal drugs were carried out.

A 'correspondence course' was established which, at minimal cost and at times of their own choosing, enables individual laboratory workers to upgrade their mycological capabilities.

Mycoplasma Reference Laboratory

(Director: Dr B E Andrews)

Surveillance for Mycoplasma pneumoniae infections by serological and isolation methods reflected a greatly increased incidence of the disease, which started in the autumn of 1981. Advantage is being taken of this to study specific immunoglobulin (IgA and IgG) reponses to M. pneumoniae infections, and also various 'auto-immune' phenomena, for instance the cold agglutinins associated with these infections. Sputum specimens are being investigated for the presence of specific antibody and antigen, as well as by routine isolation procedures. A counter-immuno-electrophoresis method has been developed for rapid detection of M. pneumoniae antigen and this test is being evaluated, with promising results.

Many samples were submitted for the detection and identification of mycoplasma contamination in tissue cultures. Fastidious strains of *M. hyorhinis* are now frequently cultivated. Collaborative studies have extended the known adverse effects of mycoplasma contamination to include interference with selection of hybrid clones in cell fusion experiments and interference with biochemical synthesis in connective tissue cells.

Venereal Diseases Reference Laboratory

(Acting Director: Dr Nafra A Johnston)

The study of antimicrobial resistance in *Neisseria gonorrhoeae* continues actively, with particular attention being paid to the plasmids which transmit penicillinase production. One thousand one hundred and thirty-five gonococci were examined. In addition, 18 905 specimens of serum were received as reference specimens for treponemal serology, and work on comparing the merits of various of the confirmatory tests for syphilis continues.

COMPUTER SERVICES

(Manager: Mr B G Fawkes)

In the Central Public Health Laboratory, the computer identification system for NCTC was converted on to the CTL 8046 with a net annual saving of £10 000. The computerised system for the Division of Enteric Pathogens (DEP) was completed successfully and the Division can now refer to previously unobtainable epidemiological information. The reagent-ordering system for the Division of Microbiological Reagents and Quality Control (DMRQC) has also been converted to operate by direct entry on the CTL equipment, and planning has started to convert the DMRQC Quality Assessment scheme. Scientific data collected during a national survey of hospital acquired infection was also analysed at Colindale.

At the Centre for Applied Microbiology and Research, the immunisation recall system developed previously was installed to assist in the management of staff vaccination. In another project, the MRC Laboratory of Molecular Biology at Cambridge generously provided access to their system for sequencing nucleic acids and this has been converted to operate on the CTL equipment. Computer Services has developed an information storage and retrieval system for the national collection of pituitaries from which human growth hormone is extracted. The system records details about the manufacture and use of growth hormone and so facilitates the making of statistical returns.

A Steering Group was established to advise on the development of a computer system for regional and area laboratories. During the year the functional requirements and systems specifications were completed and work was started on software. It is anticipated that a full evaluation of this system ('Microlab') will commence shortly.

Microcomputers are now being used extensively in PHLS. Systems were installed in laboratories at Guildford, Cardiff, Stoke-on-Trent, Nottingham and Gloucester, in the National Collection of Type Cultures and in the Leptospira Reference Laboratory for which software was specially developed. A Microcomputer User Group chaired by Dr K A V Cartwright, PHLS Laboratory, Gloucester, was established to disseminate information, to encourage the exchange of ideas and software and to minimise duplication.

HEADQUARTERS OFFICE

(Director of the Service: Dr J E M Whitehead)

Table 7 shows the staff employed in the PHLS Headquarters Office, which incorporates the Computer Services, as well as the Supplies Department and the remainder of the administrative functions of the Service.

Table 7 Numbers and grades of staff working in the Headquarters Office at 31st March 1982 (in whole-time equivalents)

Consultants	2
Other Medical	-
Top Grade and Principal Microbiologists	1
Other Microbiologists	-
Technical Officers, Principal and Senior Chief MLSOs	-
Other MLSOs	-
Administrative and Clerical	46
Ancillary and others (i.e. Craftsmen)	8
Total	57

Special Topics

CONTAMINATED FIRST-AID DRESSINGS

(Dr R R Marples, Division of Hospital Infection, Colindale)

Some imported 'sterile' dressings intended for first-aid use were found to be contaminated. The PHLS was asked to investigate, and 12 PHLS laboratories collaborated with the Division of Hospital Infection, CPHL, in a study of certain types of Standard Dressings (BPC).

Preliminary studies indicated a contamination rate of about two-thirds in the suspect dressings but also that there was a high level of accidental laboratory contamination during the performance of the examination. The procedure finally adopted was to culture whole dressings in a single medium and in the test to compare the results of culture of 25 untreated dressings with those of a control group of another 25 of the same batch which had been sterilised by irradiation.

Thirty-eight batches of Indian and 27 of British manufacture were tested. In 27 (71%) of the Indian batches the difference in growth of all species between irradiated and non-irradiated dressings signified contamination during manufacture, and another six were significantly contaminated if *Bacillus* species only were considered. In two batches no decision could be reached, and only three batches were judged to be sterile. Of the 27 batches of British manufacture, only three showed a statistical deviation from the expected result, all at the lowest level of significance. One of these batches was tested subsequently by another laboratory, which found no evidence of contamination. This apparent contamination was considered to be a statistical aberration.

The organisms recovered fell into four main groups: aerobic spore-forming bacilli (ASB), fungi, anaerobic organisms and organisms probably originating from the skin. ASBs appeared as significant contaminants in 33 of the 38 batches of dressings of Indian manufacture but in none of the dressings of British manufacture. At least 26 species of *Bacillus* were identified. *Aspergillus* contamination could be demonstrated in 12 of the 38 batches from India but in none of the batches of British dressings. While *Clostridium* species were sought, only one batch showed an excess in the non-irradiated dressings. *Micrococcaceae* and *Propionibacteria* appeared to be laboratory contaminants, arising from the skin of those performing the tests. The level of this contamination varied, depending to some extent on the use of clean air cabinets. Only six of 25 batches tested in cabinets showed a contamination rate of more than 20% while 24 of 40 batches tested in the open was as bad as this, or worse.

Although contamination was frequently detected in dressings of Indian manufacture, the individual bacterial load was low, with median counts of ASBs usually less than 10. The distribution of ASBs within the dressings was compatible with sterilisation failure, while the distribution of fungi suggested that post-sterilisation contamination through the wrapper also took place, probably while they were still wet after autoclaving.

The organisms found were of generally low pathogenic potential, but the small risk of infection is unacceptable in a dressing marked sterile.

CURRENT WORK ON CLOSTRIDIUM DIFFICILE - A NEWER INTESTINAL PATHOGEN

(Mr K D Phillips, Anaerobe Reference Unit, PHLS Laboratory, Luton)

Clostridium difficile is now firmly established as the causative organism of antibiotic-associated pseudomembranous colitis. However, recent evidence points to involvement of this species in a range of enteropathies including antibiotic and non-antibiotic associated diarrhoea.

Many clinical laboratories are now capable of isolating and presumptively identifying *Cl. difficile* from patients with diarrhoeal syndromes, largely through the use of an effective selective medium employing cycloserine and cefoxitin. However, facilities for the confirmation of the identity of these isolates by gas chromatographic analysis of metabolic end-products and demonstration of cytopathic toxin may be lacking and this service is provided by the Anaerobe Reference Unit at Luton.

Although detection in tissue cultures of the cytopathic toxin and its neutralisation by *Cl. sordellii* antitoxin is an important laboratory diagnostic test, the titre of this toxin does not invariably correlate with the severity of the disease, nor indeed is it always detectable in the presence of other positive diagnostic criteria, such as rectal pseudomembrane or isolation of *Cl. difficile* from faeces. It has recently been shown, however, that *Cl. difficile* produces an enterotoxin, currently detectable only by the rabbit ileal loop test. This second toxin appears to be a more likely candidate as the principal virulence factor of the organism. It will be necessary to characterise the toxin and devise a simple *in vitro* assay for it for use as a routine laboratory procedure.

The Anaerobe Reference Unit is currently engaged in a prospective study of the carriage rate of *Cl. difficile* in a number of population groups including neonates, their mothers, hospital in-patients and nursing staff. Reservoirs of potential infection are also being sought in the hospital environment. The significance of the isolation of multiple strains from such disparate sources, however, is often difficult to assess and would be greatly facilitated by a reliable system for typing strains of *Cl. difficile*. Work in the Anaerobe Reference Unit is progressing towards the establishment of a biotyping scheme making use of a large collection of isolates from a wide geographical area.

FACTORS CONTRIBUTING TO OUTBREAKS OF FOOD POISONING IN ENGLAND AND WALES

(Dr Diane Roberts, Food Hygiene Laboratory, Colindale)

Published reports on the incidence of bacterial food poisoning and salmonella infection in England and Wales describe the number of outbreaks and cases, location, causal agent and type of food as well as details of outbreaks of special interest and prevalence of particular types of the organisms implicated. However, little information has been published hitherto on the malpractices in food preparation which led to these outbreaks. To determine the most common contributory factors, information on food preparation, cooking and storage were extracted from reports of general and family outbreaks made to the PHLS.

Data were analysed from 1044 outbreaks of bacterial and non-bacterial food poisoning between 1970 and 1979. In 67% mass catering was implicated while in only 20% was food prepared in the home. Meat (42%) and poultry (36%) were the most commonly incriminated food vehicles.

The six principal factors contributing to 969 outbreaks are summarised in Table 8. A further seven factors contributed much less frequently. They included inadequate thawing, cross-contamination, inadequate warm

Table 8 Principal factors contributing to 969 outbreaks of bacterial food poisoning in England and Wales, 1970-9.* In many cases more than one factor operated

Contributing factor	Salmonella	Cl. perfringens	Staph. aureus	B. cereus and other Bacillus spp.
	Number of outbreaks			
	396	387	133	53
	Percentage of outbreaks in which factor recorded			
1. Preparation in advance	44	87	50	92
2. Storage at ambient temperature	29	54	41	60
3. Inadequate cooling	18	61	8	30
4. Inadequate reheating	12	56	3	55
5. Contaminated processed food (excluding canned)	27	2	19	8
6. Undercooking	23	16	1	2
10. Infected food handlers	2	-	33	-

*A further 68 outbreaks were caused by Vibrio parahaemolyticus (8), Escherichia coli (3), Yersinia enterocolitica (1), Cl. botulinum (1), scombrotoxin (47), red kidney beans (7) and virus (1). In seven outbreaks the cause was unknown.

holding, use of left-over food, consumption of raw food, preparation of very large quantities and use of contaminated canned food.

In most types of food poisoning preparation in advance and storage at ambient temperature were the two principal factors involved but others appeared to be associated with specific organisms. In outbreaks due to Salmonella use of contaminated food, undercooking and inadequate cooling were the next most commonly implicated factors. In outbreaks due to Clostridium perfringens inadequate cooling and inadequate reheating figured prominently. Infected food handlers and contaminated processed food were important in outbreaks due to Staphylococcus aureus, a significant proportion of which were also attributed to the consumption of canned foods. Contributory factors in Bacillus cereus outbreaks resembled those of Cl. perfringens.

Infected food handlers did not play a significant role except in Staph. aureus food poisoning. Although they were discovered in 126 of 792 salmonella outbreaks, in only nine (7%) was there evidence to suggest that they were the original source of the contaminating organisms. In two of the outbreaks the food handlers had recently returned from holidays in Spain, while in the other seven they had continued to prepare food while suffering symptoms of gastroenteritis. In most incidents food handlers are victims, not sources, and become infected through their frequent contact with contaminated raw food, from tasting during preparation or from eating left-over contaminated food.

The results of the analysis indicate that nearly all food poisoning could be prevented if food was eaten within 90 minutes of its preparation. This is not always practical and, indeed, early preparation leads to an outbreak only when other factors operate. The general standards of hygiene in food premises could be improved to prevent cross-contamination by thorough cleaning and disinfection between processes, especially when both raw and cooked foods are being processed. However, the analysis shows that factors related to temperature control, i.e. storage at ambient temperature, inadequate cooling or reheating, warm holding and undercooking are more frequently associated with outbreaks. Emphasis on improving this aspect would undoubtedly significantly reduce the number of outbreaks of food poisoning.

HEPATITIS A

(Dr Elise M Vandervelde, Virus Reference Laboratory, Colindale)

The epidemiological pattern of hepatitis A virus (HAV) infection has been known for many years but the virus itself has proved elusive. Although jaundice is the distinguishing feature of infection, it occurs when maximum infectivity is past. Attempts to isolate the virus from jaundiced patients are therefore unlikely to be successful. Conventional tissue cultures inoculated with known infectious material have also been unsuccessful.

Reagents for laboratory tests, therefore, have been prepared from faecal extracts either from persons incubating the disease or from laboratory-infected animals. Only certain species of marmoset and the chimpanzee are susceptible and they are expensive to rear and keep. Recently, however, a newly established continuous cell-line from fetal rhesus kidney has enabled the Virus Reference Laboratory to grow the virus in the laboratory. Although in this line the virus does not produce a cytopathic effect, virus production can be detected by radio-immunoassay (RIA), often only after a prolonged incubation period of up to 10-15 weeks. Only one serological type of HAV exists and the antigens available have been used to develop serological tests, particularly those which use minimal amounts of antigen, i.e. RIA and enzyme-linked immunoassay (ELISA).

Antibody to HAV appears at the onset of jaundice and persists. Thus detection of antibody alone does not distinguish present from past infection. However, IgM antibody is short-lived and its demonstration denotes recent infection. Commercial kits which detect either total or IgM antibody have been available for some time but they are expensive and so their use is limited. In the near future antigen prepared in tissue culture should enable serological tests - RIA or ELISA - to be more generally available for surveys of the immunity of groups of the population, and assay of the potency of immunoglobulin, as well as for diagnostic purposes. Vaccine development is already under way.

WHOOPING COUGH VACCINE

(Dr T M Pollock, Epidemiological Research Laboratory, Colindale)

The efficacy of pertussis vaccine has been a matter of controversy for some years. The early MRC trials 30 years ago showed an efficacy of 80%, but in 1968 trials made by the PHLS showed that much of the vaccine in use at that time was of low potency. The potency standard of the British vaccine was increased and most of the small studies made since then have indicated that the vaccine was effective. However, it has been suggested that social circumstances rather than vaccination played the major part in the decline of whooping cough and in one investigation of home contacts the efficacy of the vaccine was disappointingly low. It has also been claimed that the presence of respiratory viruses during whooping cough outbreaks may have confused notification figures and made it difficult to assess the true effect of the vaccine. The Epidemiological Research Laboratory has now completed a fresh assessment of the current vaccine's efficacy.

The study was made in 21 Health Authority areas in England and was based on a comparison of notification rates in children routinely vaccinated either with DT or DTP. Each area regularly provided details of the number of children according to year of birth and vaccination state and the number in each vaccination group notified as having whooping cough. The homes of the children notified were visited to record the social circumstances, the severity of the illness and its spread to other children. In each area a random sample of children given DT and DTP vaccine were visited to record the social circumstances and any differences between the two groups which might bias the findings.

Approximately 20 000 children were followed up and a comparison of the whooping cough attack rates in the DT and DTP fully vaccinated groups was published in 1982. Whooping cough was notified approximately six times more frequently in DT than in DTP vaccinated children, an overall efficacy of about 80%, but the assessment of efficacy was highly dependent on the criteria used for comparison. Among bacteriologically proven cases the efficacy was about 90% and it was also very high for children ill enough to enter hospital.

The study confirmed that pertussis vaccine, although sometimes failing to prevent infection, does ameliorate the symptoms, but protection against mild disease was less than against severe, and since mild cases are infectious the vaccine is not completely efficient in controlling whooping cough. Moreover, relatively poor protection was found for home contacts, which reflects their prolonged and intense exposure to infection by the index case. Despite these limitations the vaccine is of great value in reducing spread and preventing serious attacks.

'VIRUS STRIKES NEWSMEN'

(Abridged report from Communicable Disease Report, 1981, no. 13)

There was an explosive outbreak of 'legionitis' among British newsmen early in 1981. The episode began with the deaths of three older men, who were taken ill while staying in Benidorm. The first died, and was buried in Spain. The second died in an air ambulance on the way home; he had pneumonia and a provisional serological result led the coroner to record the death as due to legionnaires' disease, although this was not confirmed by immunofluorescence of lung tissue or by isolation of the bacterium. The third man died suddenly at the airport on his return from Spain; his death was attributed to bronchopneumonia. There was no evidence of legionnaires' disease.

All three men had travelled with the same tour operator and stayed in the same hotel. The relevant medical authorities concluded that there had been one probable case of legionnaires' disease but no firm evidence of further cases either in persons in Benidorm or after their return. The two hotels concerned were visited and no cases of pneumonia among the staff or residents came to light. Chlorine levels in the water supplies were increased by the local Spanish health authorities as a further precaution. No further action was considered necessary.

A point-source outbreak of 'legionitis' followed. A member of the Spanish public seems to have telephoned a Spanish news agency, telling them of three deaths due to legionnaires' disease, and this unconfirmed report was passed to the British press. One national newspaper's banner headline the following day was 'Virus kills tourists'. An explosive outbreak of 'legionitis' then developed with rapid newsman to newsman transmission, as correspondents vied with each other for new angles. The DHSS was accused of a cover-up, and correspondents felt aggrieved that they could not talk to 'the doctors controlling the epidemic'. Some threatened to invade CDSC, as indeed they had done once before. Precautions were taken, but the defences were penetrated by a 'visiting doctor' who turned out to be a newspaper correspondent with a PhD! The general public naturally became alarmed and many telephone calls and letters were received from anxious travellers and relatives about 'the Benidorm epidemic'. The outbreak of 'legionitis' began to subside after a few days and a little later British correspondents who visited Benidorm discovered for themselves that the 'legionitis' had been a disease that existed only in the minds of newsmen.

Communicable diseases have become more newsworthy in recent years, but this outbreak of 'legionitis' was a disease of mass communication. It caused unnecessary distress to the relatives of the men who died, anxiety to many members of the public and much extra work for clinicians and public health doctors in the United Kingdom and in Spain.

Special Problems

The statutory functions of the PHLS require that the scope of its microbiological practice extends beyond conventional clinical microbiology. The added dimension this gives to the work of regional and area laboratories may be gauged from some recent examples among the great variety of problems presented to them for investigation or advice.

HORSES' GRAVEYARDS

Two laboratories were called upon for advice on this topic. In one case, during the course of site clearance for a new housing estate, the remains of some horses had been unearthed. Enquiries of the local inhabitants revealed that some horses, which were supposed to have died of tetanus, had indeed been buried there some time before. On hearing this, the site operators had downed bulldozers and refused to do anything further until they had been convinced that it would be safe to do so.

After the laboratory director had advised that the risks to the men would be no greater than in the normal course of their duties and, in any case, in such an occupation, they should be fully immunised against tetanus anyway, no more was heard.

The other case concerned a risk of anthrax rather than tetanus, for during the Second World War a university institute had investigated ways of producing anti-anthrax serum, in the course of which 12 horses were inoculated with live cultures of anthrax bacilli and subsequently died. The carcases had been buried unopened within the site and since that time the land had been grazed by animals without any anthrax infection arising.

In 1978 the university, wishing to sell the site for residential development, had a sample of the surface soil tested for anthrax bacilli. None was found but it was indicated that this could not be taken as implying that they were absent from deeper, unsampled soil. Although anthrax spores are notoriously long-lived, experts from the Ministry of Agriculture, Fisheries and Food were of the opinion that the risk of infection continuing to be present was low and pointed out that there is no evidence of human infection with anthrax arising from contaminated soil.

The university discussed the problem with the Divisional Veterinary Officer, the director of the local PHLS laboratory and the Chief Environmental Health Officer and decided that, despite the failure to demonstrate anthrax spores, it must ensure that the ground was protected from physical disturbance, a decision with which the DoE and DHSS concurred.

Accordingly, the university arranged to cover the area (of some 2100 square metres) with a single concrete slab, thereby protecting a substantial area of ground surrounding the burial site. It was intended that the slab would be used either as a base for a car park or that it would be covered with top soil and maintained as a permanent landscaped area. In this way, the university considered that there would be no possibility of future disturbance.

The matter remained in abeyance for three years until the university applied for planning permission to develop the land for residential purposes. Publicity about the planning application and the revelation regarding anthrax experiments and the burials led to a further revelation that two heifers which had died of anthrax had also been buried in this land about 40 years previously. Doubts were thus raised as to the precise location of the buried carcases and this decided the District Council to stop the planning application pending receipt of a full report, including independent medical and scientific advice.

In an attempt to establish the exact location of the buried carcases, the university decided to draw on its multidisciplinary resources and conduct a protomagnetometry and an infra-red aerial photographic survey. At the same time, the director of the PHLS laboratory, in consultation with the Chief Environmental Officer of the District Council, arranged for the assistance of a PHLS colleague, expert on anthrax, from CAMR, Porton Down.

As a preliminary several surface samples of soil were examined at CAMR for anthrax spores and all proved negative. To locate more exactly the buried carcases, before deep soil samples were collected, the university used a radar technique. Soil samples were then taken at depths from 2 to 3 metres. These were also negative for anthrax bacilli but, interestingly, their total bacterial counts were markedly higher than those of the surface samples. Furthermore, the deep soil samples contained much calcium, probably from the lime used to cover the carcases at burial. These findings suggest that the deep soil samples had, as intended, been taken from soil rich in organic matter resulting from decomposition of the buried carcases, thereby confirming that the intensive efforts with advanced technology to locate the carcases accurately had been successful.

AN INFECTIVE PERK

Over a period of months many staff of a pharmaceutical company's research farm appeared to be afflicted with a strange illness. Although the same clinical features were not consistently present, the company doctor was concerned that he had a smouldering outbreak on his hands and sought the help of his local PHLS laboratory.

The pharmaceutical company's establishment consisted of several laboratories on a farmland site. Animal lairs accommodating cattle, pigs, sheep and dogs were sited adjacent to the laboratory buildings. During the four months from early spring to early summer, 23 of 119 staff of various catagories had suffered from an illness, the main features of which were fever, headache, peri-orbital pain, diarrhoea and vomiting.

Enquiries established that both sheep and cattle grazed in the fields around the laboratories. Lambing took place in the spring, but calving did not take place on this site. Unpasteurised milk was served in the canteen and sold cheaply to the staff to take home. Blood samples were obtained from 21 of 23 staff who had been ill and from a sample of workers who claimed not to have been ill during the relevent period. Blood was also obtained from ewes, cows and piglets and milk samples from eight cows. Laboratory tests showed a highly significant association between the illness and raised antibody titres to Coxiella burnetii, the causative organism of Q fever; furthermore, two-thirds of the sheep and cows had antibodies to this organism which was isolated from seven of eight milk samples.

It seemed clear that many of the staff had been suffering from Q fever acquired either from the raw milk or by exposure to airborne infection from the animals (particularly the lambs at the time of lambing). Although there was little that could be done regarding the latter hazard, withdrawal of unpasteurised milk seemed a control procedure that would be simple to implement. This, however, proved not to be so, for the staff were used to this subsidy and were strongly disinclined to relinquish it. The management was advised, therefore, to continue the practice of supplying virtually free milk to their staff but to buy pasteurised milk for this purpose.

FAST FOOD SAFETY

Following several complaints from patrons of a country-wide hamburger chain, samples of the company's products were taken for bacteriological investigation. An assortment of types and sizes of the company's products were submitted and were found to contain Bacillus cereus and faecal streptococci in the order of a million organisms per gram. Testing of the individual ingredients used in the composite burgers showed that the trouble lay in the 'mayonnaise'. This was somewhat unexpected as the substance had a pH value of 4 (i.e. so acid that few bacteria can multiply). It transpired, however, that large portions of poorly processed (i.e. poorly cleaned) vegetables were being added to the mayonnaise mix, resulting in the heavy microbiological contamination. The firm undertook to 'pasteurise' the vegetables and further increase the acidity of the mayonnaise by reducing its pH to 3.5. The product now offered is so bland that, even before cooking, it is virtually sterile.

FREEZE-DRIED CATERPILLARS

Biological methods are increasingly used for the control of insecticide-resistant pests, whereby their natural predators are encouraged to proliferate at the expense of the pestiferous host.

A PHLS laboratory received an enquiry from the research section of a manufacturer of agricultural chemicals. Apparently they had produced a biological pesticide which they hoped to put into commercial production. However, under some ministerial regulation, they were required to show that any such product would be free from bacteria likely to be pathogenic for man - could the laboratory do some suitable tests to enable them to market this product?

In the present era of heightened concern about laboratory safety, the laboratory staff wished to know more about the nature of this substance that they were being asked to test. For reasons of commercial secrecy the manufacturers were unwilling to reveal the precise nature of the material, but eventually it emerged that it consisted essentially of freeze-dried caterpillars, presumably containing some viable part of the appropriate predator. It was remarkably free from bacteria of any kind and no potential pathogens were found. It may now be on the market.

FRACTURE PREVENTED

A veterinary surgeon, whose brother happened to be a consultant, had brought to him some small beetles which a farmer had found in his bed and was very worried about what they might be. In due course the consultant brought the beetles to a PHLS laboratory for identification. The specimen submitted contained many wood-boring beetles and the laboratory director was intrigued to know how so many came to live in somebody's bed. The information was relayed to the veterinary surgeon who in turn vouchsafed the information that the man who had found them possessed a wooden leg, which was subsequently examined and found to be in a state of dangerous decay. The laboratory director received a letter of grateful thanks from the veterinary surgeon and his 'patient'.

Senior PHLS Staff

HEADQUARTERS OFFICE

61 Colindale Avenue, London NW9 5EQ
Tel: 01-200 1295

Dr J E M Whitehead	Director of the Service
Dr Joan R Davies	Deputy Director of the Service (part-time)
Dr P D Meers	Deputy Director of the Service
Dr R A Bassett	Assistant Director of the Service
Mr R S Sawyer	Secretary to the Board (to 31.1.82)
Mr P Murphy	Deputy Secretary to the Board
Mr A W Haggar	Finance Officer
Mr A G Edney	Deputy Finance Officer (to 21.10.81)
Mr P P Taylor	Personnel Officer
Mr G L Rodham	New Colindale Project Manager
Mr B G Fawkes	Manager, PHLS Computer Services
Mr J B Towell	Supplies Officer

CENTRAL PUBLIC HEALTH LABORATORY

Colindale Avenue, London NW9 5HT
Tel: 01-205 7041

Professor A A Glynn	Director
Miss M A Jackson-Roberts	Administrator
Miss Betty H Whyte	Librarian
Dr B Rowe	Director, Division of Enteric Pathogens, and Deputy Director, CPHL
Dr R R Marples	Acting Director, Division of Hospital Infection
Dr P S Gardner	Director, Division of Microbiological Reagents and Quality Control

Dr T M Pollock	Director, Epidemiological Research Laboratory
Dr R J Gilbert	Director, Food Hygiene Laboratory
Dr Joyce D Coghlan	Director, Leptospira Reference Laboratory (to 6.12.81)
Dr Sheena Waitkins	Director, Leptospira Reference Laboratory (from 7.12.81)
Dr L R Hill	Curator, National Collection of Type Cultures
Dr Marguerite S Pereira	Director, Virus Reference Laboratory

CENTRE FOR APPLIED MICROBIOLOGY AND RESEARCH

Porton Down, Salisbury, Wiltshire SP4 0JG
Tel: 0980-610391

Dr P M Sutton	Director
Mr P Holmes	Deputy Director
Mr I R Ingrey-Counter	Administrator
Dr M J Hill	Director, Bacterial Metabolism Research Laboratory
Professor T Atkinson	Director, Microbial Technology Laboratory
Dr A E Wright	Director, Microbiological Safety Reference Laboratory
Dr P J Greenaway	Director, Molecular Genetics Laboratory
Professor D C Ellwood	Director, Pathogenic Microbes Research Laboratory
Professor D I H Simpson	Director, Special Pathogens Reference Laboratory
Dr H E Wade	Director, Therapeutic Products Laboratory
Professor J Melling	Director, Vaccine Research and Production Laboratory

COMMUNICABLE DISEASE SURVEILLANCE CENTRE

61 Colindale Avenue, London NW9 5EQ
Tel: 01-200 6868

Dr N S Galbraith	Director
Mr A A Collins	Administrator

OTHER REFERENCE LABORATORIES AND UNITS

Dr A T Willis	Director, Anaerobe Reference Unit, PHLS Laboratory, Luton
Professor D J Bradley	Co-Director, Malaria Reference Laboratory, London School of Hygiene and Tropical Medicine
Professor W Peters	Co-Director, Malaria Reference Laboratory, London School of Hygiene and Tropical Medicine
Dr P A Jenkins	Director, Mycobacterium Reference Unit, PHLS Laboratory, Cardiff
Professor D W R Mackenzie	Director, Mycological Reference Laboratory, London School of Hygiene and Tropical Medicine
Dr B E Andrews	Director, Mycoplasma Reference Laboratory, PHLS Laboratory, Norwich
Dr Nafra A Johnston	Acting Director, Venereal Diseases Reference Laboratory, London Hospital Research Laboratories

REGIONAL LABORATORIES

Addresses and telephone numbers of PHLS Regional Laboratories are listed in relevant telephone directories

Dr J G P Hutchison	Director, PHLS Laboratory, Birmingham
Dr A E Jephcott	Director, PHLS Laboratory, Bristol
Dr C E D Taylor	Director, PHLS Laboratory, Cambridge
Dr C H L Howells	Director, PHLS Laboratory, Cardiff
Dr G L Gibson	Director, PHLS Laboratory, Leeds
Dr G C Turner	Director, PHLS Laboratory, Liverpool
Dr D M Jones	Director, PHLS Laboratory, Manchester
Dr J B Selkon	Director, PHLS Laboratory, Newcastle upon Tyne
Dr H H Johnston	Acting Director, PHLS Laboratory, Oxford
Dr D J H Payne	Director, PHLS Laboratory, Portsmouth
Dr B W Barton	Director, PHLS Laboratory, Sheffield

AREA LABORATORIES

Addresses and telephone numbers of PHLS Area Laboratories are listed in relevant telephone directories.

Dr P G Mann	Director, PHLS Laboratory, Bath
Dr B T Thom	Director, PHLS Laboratory, Brighton
Dr D G Davies	Director, PHLS Laboratory, Carlisle
Dr H D S Morgan	Director, PHLS Laboratory, Carmarthen
Dr R Pilsworth	Director, PHLS Laboratory, Chelmsford
Dr Pauline M Poole	Director, PHLS Laboratory, Chester
Dr P R Mortimer	Director, PHLS Laboratory, Coventry
Dr Patricia Gill	Director, PHLS Laboratory, Dorchester
Dr D R Gamble	Director, PHLS Laboratory, Epsom
Dr R J C Hart	Director, PHLS Laboratory, Exeter
Dr K A V Cartwright	Director, PHLS Laboratory, Gloucester
Professor R Y Cartwright	Director, PHLS Laboratory, Guildford
Dr I R Ferguson	Director, PHLS Laboratory, Hereford
Dr S L Mawer	Director, PHLS Laboratory, Hull
Dr J V T Gostling	Director, PHLS Laboratory, Ipswich
Dr C J Mitchell	Director, PHLS Laboratory, Leicester
Dr J G Wallace	Director, PHLS Laboratory, Lincoln
Dr D A McSwiggan	Director, PHLS Laboratory, Central Middlesex Hospital, London
Dr C Dulake	Director, PHLS Laboratory, Dulwich, London
Dr D G Fleck	Director, PHLS Laboratory, Tooting, London
Dr B Chattopadhyay	Director, PHLS Laboratory, Whipps Cross, London
Dr A T Willis	Director, PHLS Laboratory, Luton
Dr A L Furniss	Director, PHLS Laboratory, Maidstone
Dr E McKay-Ferguson	Director, PHLS Laboratory, Middlesbrough
Dr W Shepherd	Director, PHLS Laboratory, Norwich
Dr M J Lewis	Director, PHLS Laboratory, Nottingham

Dr R S Jobanputra	Director, PHLS Laboratory, Peterborough
Dr P J Wilkinson	Director, PHLS Laboratory, Plymouth
Dr W L Hooper	Director, PHLS Laboratory, Poole
Dr L Robertson	Director, PHLS Laboratory, Preston
Dr J V Dadswell	Director, PHLS Laboratory, Reading
Dr F B Jackson	Director, PHLS Laboratory, Rhyl
Dr Sharon Patrick	Director, PHLS Laboratory, Salisbury
Dr C A Morris	Director, PHLS Laboratory, Shrewsbury
Dr A D Pearson	Director, PHLS Laboratory, Southampton
Dr C R Knappett	Director, PHLS Laboratory, Stoke-on-Trent
Dr W Kwantes	Director, PHLS Laboratory, Swansea
Dr J V S Pether	Director, PHLS Laboratory, Taunton
Dr J Telfer Brunton	Director, PHLS Laboratory, Truro
Dr M T Moulsdale	Director, PHLS Laboratory, Watford
Dr I A Harper	Director, PHLS Laboratory, Wolverhampton

Principal Committees

COMMITTEES APPOINTED BY THE BOARD

Estimates Committee	Chairman: Dr C E Gordon Smith Secretary: Mr A W Haggar (to 31.1.82)
Capital Projects Committee	Chairman: Mr C C Stevens Secretary: Mr P Murphy
Steering Committee for the Communicable Disease Surveillance Centre	Chairman: Dr J E M Whitehead Secretary: Dr Susan E J Young
Steering Committee for Microbiology Quality Control	Chairman: Dr Joan R Davies Secretary: Dr P R Mortimer
Steering Committee on Income Generating Activities	Chairman: Professor M H Richmond Secretaries: Dr R A Bassett and Mr P Murphy
Ethical Committee	Chairman and Secretary to be appointed

COMMITTEES APPOINTED BY THE DIRECTORS' MEETING

Standing Advisory Committee on Communicable Disease Information	Chairman: Dr D R Gamble Secretary: Ms Diana Gorton
Standing Advisory Committee on Electron Microscopy	Chairman: Dr T H Flewett Secretary: Dr Anne M Field
Standing Advisory Committee on Influenza	Chairman: Dr R J C Hart Secretary: Dr C A Morris
Standing Advisory Committee on Laboratory Safety	Chairman: Dr A E Wright Secretary: Dr J V S Pether
Standing Advisory Committee on Monographs	Chairman and Secretary: Dr C H L Howells
Standing Advisory Committee on Serological Reagents	Chairman: Dr Joan R Davies Secretary: Dr P S Gardner

SUBCOMMITTEES AND WORKING PARTIES

Standing Subcommittee on Library Services	Joint Chairmen: Professor D W R Mackenzie and Miss Betty H Whyte Secretary: Miss Betty H Whyte
Standing Subcommittee on Examination of Water Supplies	Chairman: Dr G I Barrow Secretary: Dr J A Rycroft

Subcommittee on Farmer's Lung	Chairman and Secretary: Professor D W R Mackenzie
Subcommittee on Hepatitis	Chairman: Dr J Craske Secretary: Dr Sheila Polakoff
Subcommittee on Laboratory Autoclaves	Chairman: Dr J E M Whitehead (to 12.3.81) Secretary: Dr C A Morris (to 12.3.81)
Subcommittee on Salmonellas	Chairmen: Dr J D Abbott (to 16 2.82) and Dr J G Cruickshank (from 22.3.82) Secretaries: Dr B Rowe (to 16.2.82) and Dr S L Mawer (from 22.3.82)
Working Party on Human Infections by Group B Streptococci	Convenor: Dr B T Thom Secretary: Dr R T Mayon-White
Working Party on Streptococcal Infection in Abattoir Workers	Chairman: Dr C A Morris Secretary: Dr H W K Fell
Working Party on Campylobacter Infections	Chairman: Dr M B Skirrow
Zoonoses Consultative Panel	PHLS representatives: Director of the Service (or Deputy), Dr G I Barrow, Dr D J H Payne, Dr B Rowe

Senior Staff Changes

NEW APPOINTMENTS

Dr H Appleton	Principal Microbiologist, Virus Reference Laboratory, Central Public Health Laboratory, Colindale. 1.9.81.
Dr E O Caul	Principal Microbiologist, Regional PHLS Laboratory, Bristol. 19.5.81.
Dr M T Moulsdale	Consultant Medical Microbiologist, Director, Area PHLS Laboratory, Watford. 1.9.81.
Dr P Norman	Consultant Medical Microbiologist, Regional PHLS Laboratory, Sheffield. 12.10.81.
Dr J D Oram	Principal Microbiologist, Deputy Director, Molecular Genetics Laboratory, Centre for Applied Microbiology and Research. 1.2.82.
Mr R B Paget	Secretary to the Board, Headquarters Office. 1.4.82.
Dr J E Roff	Principal Microbiologist, Quality Controller, Centre for Applied Microbiology and Research, Porton Down. 1.4.81.
Mr L B Spark	Principal Microbiologist, Process Plant Manager, Centre for Applied Microbiology and Research, Porton Down. 1.2.82.

TRANSFERS

Dr G I Barrow	Consultant Medical Microbiologist, Area PHLS Laboratory, Chelmsford. 30.11.81.
Dr T J Coleman	Consultant Medical Microbiologist, Deputy Director, Area PHLS Laboratory, Hereford. 9.11.81.
Dr P D Meers	Deputy Director of the Service, Headquarters Office. 1.7.81
Dr S A Rousseau	Consultant Medical Microbiologist, Area PHLS Laboratory, Luton. 1.7.81.
Dr D C Turk	Consultant Medical Microbiologist, Deputy Director, PHLS Laboratory, Sheffield. 12.10.81.
Dr J E M Whitehead	Director of the Service, Headquarters Office. 1.7.81

RETIREMENTS

Dr J D Abbott	Consultant Medical Microbiologist, PHLS Laboratory, Manchester. 28.2.82.
Dr D R Christie	Consultant Medical Microbiologist, Director, PHLS Laboratory, Hereford.
Dr Joyce Coghlan	Principal Microbiologist, Director, Leptospira Reference Laboratory. 28.2.82.
Dr B R Eaton	Consultant Medical Microbiologist, Director, PHLS Laboratory, Watford. 31.3.81.
Dr J A Rycroft	Consultant Medical Microbiologist, PHLS Laboratory, Chelmsford. 31.3.81.
Miss J M Watkinson	Principal Microbiologist, PHLS Laboratory, Manchester. 13.7.81
Sir Robert Williams	Consultant Medical Microbiologist, Director of the Service. 30.6.81
Dr M A M Wilson	Consultant Medical Microbiologist, Deputy Director, PHLS Laboratory, Sheffield. 9.10.81.

RESIGNATIONS

Mr R S Sawyer	Secretary to the Board. 31.1.82.
Dr D V Seal	Consultant Medical Microbiologist, PHLS Laboratory, Southampton. 1.2.82.
Dr P C B Turnbull	Principal Microbiologist, Food Hygiene Laboratory, Central Public Health Laboratory. 17.7.81.

Honours, Awards and External Offices

Professor A Atkinson	Honorary Professor, Department of Biological Sciences, University of Warwick
Professor R Y Cartwright	Honorary Visiting Professor in Clinical Microbiology, University of Surrey
Dr R J Gilbert	Member, European Economic Commission (EEC) Scientific Veterinary Committee
Dr D N Hutchinson	Member of Council, Association of Clinical Pathologists
Dr P A Jenkins	Secretary, European Society for Mycobacteriology
Dr D M Jones	Member of Council, the Royal College of Pathologists
Professor D W R Mackenzie	General Secretary, International Society for Human and Animal Mycology
Dr B Rowe	Chairman, Global Scientific Working Group on Bacterial Enteric Infections, World Health Organisation
Mrs Jane Storey	J D Atkinson Award, 1981
Dr C E D Taylor	Vice-President, British Society for the Study of Infection
Dr J E M Whitehead	Consultant Advisor in Microbiology, Department of Health and Social Security
Dr P J Wilkinson	Secretary, European Society of Paediatric Infectious Diseases (ESPID)
Sir Robert Williams	Chairman, Advisory Group on Hepatitis, Department of Health and Social Security

Publications by Members of Staff during 1981

In addition to the items mentioned below, there are many publications to which the work of the Service has contributed. The internationally recognised reference laboratories and the Communicable Disease Surveillance Centre submit figures regularly to WHO for inclusion in thier statistical periodicals. Again, the giving of specialist help and advice and the supply of serological reagents are among the functions of the Service, and in the course of the year a number of papers have acknowledged such contributory work by members of the staff. Other unlisted material includes leading articles, unsigned annotations, conference papers which remain unpublished, book reviews, contributions to the various abstracting journals, and notes in the Service's weekly *Communicable Disease Report*.

PAPERS, ABSTRACTS AND CONTRIBUTIONS TO EDITED VOLUMES

Abbott, J D and Sutcliffe, E M. Serotyping of *Campylobacter jejuni*. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Akrigg, A, Gardner, S D and Greenaway, P J. Molecular cloning of infectious DNA from human papovavirus BK in *Escherichia coli*. *J. gen. Virol*., 1981, **55**, 247

Alderson, D, Strong, A J, Ingham, H R and Selkon, J B. Fifteen-year review of the mortality of brain abscess. *Neurosurgery*, 1981, **8**, 1

Aldova, E, Lee, J V, Bencatova, A, Bolchova, S, Durkovsky, J, Geizer, E, Hausner, O, Hocmanova, M, Pauckova, V and Zofka, P. *Vibrio metschnikovii* in Czechoslovakia. *Csl. Epidem*., 1981, **30**, 244. (In Czech, with English summary)

Al-Tikriti, S K, Al-Ani, F, Jurji, F J, Tantawi, H, Al-Moslih, M, Al-Janabi, N, Mahmud, M I A, Al-Bana, A, Habib, H, Al-Munthri, H, Al-Janabi, S, Al-Jawahry, K, Yonan, M, Hassan, F and Simpson, D I H. Congo/Crimean haemorrhagic fever in Iraq. *Bull. World Hlth. Org*., 1981, **59**, 85

Amos, R W. Evaluation of Amies transport medium for mid-term storage of *Campylobacter* sp. isolates from human faeces. *Med. Lab. Sci*., 1981, **38**, 65

Andrewes, D A, Chuter, P J, Dawson, M J, Eden, B W, Moore, R M A, Feestone, D S and Morris, C A. Trimethoprim and co-trimoxazole in the treatment of acute urinary tract infections: patient compliance and efficacy. *J. R. Coll. gen. Practit*., 1981, **31**, 274

Andrews, B E, Major, R and Palmer, S R. Ornithosis in poultry workers. *Lancet*, 1981, **i**, 632

Appleton, Hazel. Outbreaks of viral gastroenteritis associated with the consumption of shellfish. In: *Virus and wastewater treatment: proceedings of the international symposium, Guildford, 1980*, edited by M

Goddard and M Butler, p. 287. Oxford, Pergamon Press, 1981

Appleton, Hazel, Buckley, M and Mawer, S L. Virus particles in oysters. (Letter) *Brit. med. J.*, 1981, **282**, 1974

Appleton, Hazel, Palmer, S R and Gilbert, R J. Foodborne gastroenteritis of unknown aetiology: a virus infection? *Brit. med. J.*, 1981, **282**, 1801

Arya, O P, Mallinson, H and Andrews, B E. Ureaplasma urethritis? Do leucocyte counts provide a clue? *Abstr. I. sexu. transm. Dis. World Congr., San Juan, Puerto Rico, 1981*, p. 8, also in French, p. 52

Arya, O P, Mallinson, H and Goddard, A D. Epidemiological and clinical correlates of chlamydial infection of the cervix. *Brit. J. vener. Dis.*, 1981, **57**, 118

Arya, O P, Mallinson, H, Pareek, S S and Goddard, A D. Post-gonococcal cervicitis and post-gonococcal urethritis: a study of their epidemiological correlation and the role of *Chlamydia trachomatis* in their aetiology. *Brit. J. vener. Dis.*, 1981, **57**, 395

Ashley, Adrienne S. A study of the restriction of coliphages by enterobacterial resistance plasmids. (Thesis summary) *Med. Lab. Sci.*, 1981, **38**, 144

Atkinson, A, Hammond, P M, Hartwell, R D, Hughes, P, Scawen, M D, Sherwood, R F, Small, D A P, Bruton, C J, Harvey, M J and Lowe, C R. Triazine-dye affinity chromatography. *Biochem. Soc. Trans.*, 1981, **9**, 290

Atkinson, A, Lowe, C R, Mosbach, K and Small, D A P. High pressure liquid affinity chromatography. *U.K. Patent Application* 8112897

Atkinson, A, McArdell, J, Scawen, M D, Sherwood, R F, Small, D A P, Lowe, C R and Bruton, C J. The potential of organic dyes as affinity ligands in protein studies. *Analyt. Chem. Symp.*, 1981, **9**, 399

Bailey, N and Capel, B. Computerized chemical analysis. (Abstract) *Trans. R. Soc. trop. Med. Hyg.*, 1981, **75**, 882

Ball, A P, Farrell, I D, Brookes, G R, Snow, M and Davey, P G. Disposition studies of augmentin formulations. In: *Augmentin: clavulanate-potentiated amoxycillin. Proceedings of the first symposium, [Burgenstock, Switzerland], 1980*, edited by G N Rolinson and A Watson, p. 117. Amsterdam, Excerpta Medica, 1980

Ball, A P, Geddes, A M, Davey, P G, Farrell, I D and Brookes, G R. Augmentin in amoxycillin-resistant urinary tract infection. In: *Augmentin: clavulanate-potentiated amoxycillin. Proceedings of the first symposium, [Burgenstock, Switzerland], 1980*, edited by G N Rolinson and A Watson, p. 132. Amsterdam, Excerpta Medica, 1980

Ball, Lyn C and Colman, G. A comparison of conventional methods and API galleries for the identification of streptococci. *Abstr. VIII int. Symp. Strep. strep. Dis., Lund, 1981*, p. 11

Band, J D, Clegg, H W, Hayes, P S, Facklam, R R, Stringer, J and Dixon, R E. Transmission of group B streptococci, traced by use of multiple epidemiologic markers. *Amer. J. Dis. Child.*, 1981, **135**, 355

Barrell, R A E. The survival of *Campylobacter coli/jejuni* in unpasteurised milk. *J. Infect.*, 1981, **3**, 348

Barrell, R A E and Watkinson, J M. The bacteriology of cooked meats. *Environm. Hlth*, 1981, **89**, 148

Barrow, G I. Balneazione e rischi microbici per la salute. In: *Balneazione e qualita microbiologiche delle acque: atti del simposio scientifico internazionale, Genova, 1981*, p. 37. Roma, Edimez, 1981

Barrow, G I. Microbial pollution of coasts and estuaries: the public health implications. *Wat. Pollut. Contr.*, 1981, **80**, 221, previously published as *Annu. Conf. Inst. Wat. Pollut. Contr. Buxton, 1980*, Conf. Pap. No. 7, 8 pp.

Barrow, G I. The national and international outlook for microbiologists in the water industry. (Abstract) *J. appl. Bact.*, 1981, **51**, iv

Barrow, G I, Burman, N P and Collins V G. Membrane filtration: a European view. In: *Membrane filtration: applications, techniques and problems*, edited by D J Dutka, p. 265. New York, Dekker, 1981

Bartholomew, Barbara, Caygill, C P J and Hill, M J. Investigation into the sources of urinary nitrate. (Abstract) *Biochem. Soc. Trans.*, 1981, **9**, 333P

Bartlett, C L R. *Legionella pneumophila* in hospital water systems. In: *Symposium: hospital water supplies. Report of proceedings, Loughborough, 1981*, 3 pp.

Bartlett, C L R and Miller, A C. Legionnaires' disease. *Med. int. (U.K. ed.)*, 1981, **1**, 183

Baskerville, A, Fitzgeorge, R B, Broster, M, Hambleton, P and Dennis, P J L. Experimental transmission of Legionnaires' disease by exposure to aerosols of *Legionella pneumophila*. *Lancet*, 1981, ii, 1389

Baskerville, A, Satti, A G O, Murphy, F A and Simpson, D I H. Congo-Crimean haemorrhagic fever in Dubai: histopathological studies. *J. clin. Path.*, 1981, **34**, 871

Bell, J C, Jacob, M and Palmer, S R. Legal and ethical aspects of salmonellosis. *Vet. Rec.*, 1981, **109**, 301

Berrie, J H. Surprises, but change from drift to shift still awaited. *Flu Rev.*, 1981, No. 3, 2

Billingham, Julia D and Slack, M P E. Cholecystitis and subphrenic abscess caused by *Salmonella virchow*. *Postgrad. med. J.*, 1981, **57**, 308

Birch, B R, Perera, B S, Hyde, W A, Ruehorn, V, Ganguli, L A, Kramer, J M and Turnbull, P C B. *Bacillus cereus* cross-infection in a maternity-unit. *J. Hosp. Infect.*, 1981, **2**, 349

Black, R E, Merson, M H, Rowe, B, Taylor, P R, Alim, A R M A, Gross, R J and Sack, D A. Enterotoxic *Escherichia coli* diarrhoea: acquired immunity and transmission in an endemic area. *Bull. World Hlth Org.*, 1981, **59**, 263

Blazek, R and Benbough, J E. Improvement in the persistence of microbial asparaginase and glutaminase in the circulation of the rat by chemical modifications. *Biochim. biophys. Acta*, 1981, **677**, 220

Bolton, F J. Experiences with *Campylobacter jejuni/coli*. *I.M.L.S. N. Reg. Microbiol. Grp Proc. Meet., 1980*, 1981, pp. unnumb.

Bolton, F J and Robertson, L. A selective medium for isolating *Campylobacter jejuni/coli*. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect. Reading, 1981*, pp. unnumb.

Bowen, E T W and Simpson, D I H. Dangerous virus diseases. *Hosp. Update*, 1981, 7, 175

Boyle, J M, Hopkins, J, Fox, M, Allen, T D and Leach, R H. Interference in hybrid clone selection caused by *Mycoplasma hyorhinis* infection. *Exp. Cell Res.*, 1981, **132**, 67

Brearley, B F and Hutchinson, D N. Endocarditis associated with *Chlamydia trachomatis* infection. *Brit. Heart J.*, 1981, **46**, 220

Brown, D F J. Animal models as predictors of therapeutic efficacy in bacterial infections in humans. *J. antimicrob. Chemother.*, 1981, 7, 213

Brown, D F J, Birks, S F, Curtis, G D W and Perks, E. Gentamicin fluoroimmunoassay kit. (Letter) *J. antimicrob. Chemother.*, 1981, 7, 205

Brown, D F J and Reynolds, P E. Intrinsic resistance to beta-lactam antibiotics in *Staphylococcus aureus*. *FEBS Lett.*, 1980, **122**, 275

Bruce, D. Campylobacters in cats and dogs. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Brunton, W A T and Moyes, A. The use of *Pseudomonas aeruginosa* for the typing of thermophilic campylobacters. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Bryden, A S, Mavromichalis, I, Hutchinson, D N, Hudson, P, Dodd, B, Dematia, M, Tsouruksoglou, G and Sklavunu-Zurukzoglou, S. Incidence of rubella antibodies in the population of northern Greece. *Acta microbiol. hellen.*, 1981, **26**, 59

Buluwela, L, Malcolm, A D B, Coleman, D V and Gardner, S D. The use of the restriction endonuclease Ddel for mapping related DNAs. *Biosci. Rep.*, 1981, 1, 223

Butcher, G A. Suspension culture of *P. falciparium*: manual and semi-automated methods. (Abstract) *Trans. R. Soc. trop. Med. Hyg.*, 1981, 75, 882

Campbell, A N, Sill, P R and Wardle, J K. Listeria meningitis acquired by cross-infection in a delivery suite. (Letter) *Lancet*, 1981, ii, 752

Carpenter, Enid M. The laboratory and urinary infections in general practice. *Salisbury med. Bull.*, 1981, No. 42, 577

Cartwright, R Y. Antifungal agents. *Med. int. (Mid. East ed.)*, 1981, 1, 173

Cartwright, R Y. Therapy of fungal diseases. In: *Scientific foundations of respiratory medicine*, edited by J G Scadding and G Cumming, p. 657. London, Heinemann, 1981

Casewell, M W, Pugh, S F and Dalton, M T. Correlation of antibiotic usage with an antibiotic policy in a urological ward. *J. Hosp. Infect*., 1981, 2, 55

Charlton, C A C, Crowther, A, Davies, J G, Dines, J, Jackson, G E, Mann, P G, Rye, S, Valentine, J P and White, D G. Three-day and one-day chemotherapy for urinary tract infections in general practice. *J. antimicrob. Chemother*., 1981, **8**, 409

Chattopadhyay, B. Laboratory facilities. I. Bacteriological requirements and the I.T.U. In: *The medical management of the critically ill*, edited by G C Hanson and P L Wright, p. 791. London, Academic Press, 1978

Chattopadhyay, B, Hall, I and Curnow, S R. Ceftazidime (GR 20263), a new cephalosporin derivative with excellent activity against pseudomonas and *Enterobacteriaceae*. *J. antimicrob. Chemother*., 1981, **8**, 491

Chattopadhyay, B, Hall, I and Curnow, S R. Distribution of extraurinary beta-haemolytic streptococci in clinical specimens. (Letter) *J. Hosp. Infect*., 1981, **2**, 192

Chattopadhyay, B and Teli, J C. Gentamicin-resistant *Staphylococcus aureus* after topical therapy in general practice. (Letter) *J. Hosp. Infect*., 1981,**2**, 278

Chattopadhyay, B and Teli, J C. Susceptibility of coagulase negative staphylococci to fourteen antimicrobial agents. *Microbios Lett*., 1981, **17**, 151

Chessum, B S and Fleck, D G. A neat piece of detective work but modesty prevents.... (Letter) *World Med*., 1981, **17**, No. 1, p. 14

Christenson, P, Burova, L A, Grubb, A, Grubb, R, McLaughlan, J, Schalen, C and Widdowson, J P. Antigenic sites on streptococcal components carrying IgC Fc-receptors: relation to the M-associated protein antigens. *Abstr. VIII int. Symp. Strep. strep. Dis., Lund, 1981*, p. 97

Clark, S P, Lach, V H and Lidwell, O M. The performance of the Biotest RCS centrifugal air sampler. *J. Hosp. Infect*., 1981, **2**, 181

Clarke, Mina and Maskell, R M. Gonorrhoea presenting as 'sterile' pyuria. (Letter) *Brit. med. J*., 1981, **283**, 1546

Coghlan, Joyce D. Aspects cliniques et traitement des leptospiroses. *Med. Mal. infect*., 1981, **11**, 114

Coghlan, Joyce D. Specificite des fractions antigeniques des leptospires. *Med. Mal. infect*., 1981, **11**, 109

Cohen, B J. Detection of anti-HBc by RIA. (Abstract) *Med. Lab. Sci*., 1981, **38**, 429

Cohen, B J, Heweish, R A and Mortimer, P P. Comparison of radioimmunoassay and counter-immunoelectrophoresis for the detection of antibody to hepatitis B core antigen. *J. virol. Meth*., 1981, **2**, 1981

Collins, C H. Hazards of mouth pipetting. (Letter) *Gaz. Inst. med. Lab. Sci*., 1981, **25**, 232

Collins, C H. New Zealand - a conference visitor's view. *Gaz. Inst.*

med. Lab. Sci., 1981, **25**, 505

Collins, C H. *Salmonella typhi*, the Howie Code and the Rideal-Walker test. *Lab. Pract.*, 1981, **30**, 123

Collins, C H and Gunthorpe, W J. Centrifuges in safety cabinets. *Gaz. Inst. med. Lab. Sci.*, 1981, **25**, 230

Collins, C H and Gunthorpe, W J. Design and operation of containment laboratories. (Abstract) *Int. Environm. Saf.*, 1981, Aug., p. 34

Collins, C H and Gunthorpe, W J. Safety goods and services. *Med. Lab. World*, 1981, Nov., p. 19

Collins, C H and Yates, M D. Low frequency of rifampicin-resistant tubercle bacilli. *Abstr. XII int. Congr. Chemother.*, *Florence, 1981*, p. 173

Collins, C H, Yates, M D and Down, G F. False positive direct films in tuberculosis bacteriology. *Med. Lab. Sci.*, 1981, **38**, 129

Collins, C H, Yates, M D and Grange, J M. A study of bovine strains of *Mycobacterium tuberculosis* isolated from humans in South-East England, 1977-1979. *Tubercle, Lond.*, 1981, **62**, 113

Colver, G B, Chattopadhyay, B, Francis, R S and Kunzru, K M N. Arthritis of the subtalar joint due to *Mycobacterium fortuitum*. *Brit. med. J.*, 1981, **283**, 469

Cookson, B D, Houang, E C and Lee, J V. Clustering of *Aeromonas hydrophila* septicaemia. (Letter) *Lancet*, 1981, ii, 1232

Cradock-Watson, J E, Ridehalgh, M K S, Anderson, M J and Pattison, J R. Outcome of asymptomatic infection with rubella virus during pregnancy. *J. Hyg., Camb.*, 1981, **87**, 147

Cranage, M P, Gardner, P S and McIntosh, K. In vitro cell-dependent lysis of respiratory syncytial virus-infected cells mediated by antibody from local respiratory secretions. *Clin. exp. Immunol.*, 1981, **43**, 28

Cranage, M P, Stott, E J, Nagington, J and Coombs, R R A. A reverse passive haemagglutination test for the detection of respiratory syncytial virus in nasal secretions from infants. *J. med. Virol.*, 1981, **8**, 153

Craske, J. The epidemiology of factor VIII and IX-associated hepatitis in the United Kingdom. (Abstract) *Med. Lab. Sci.*, 1981, **38**, 430

Crawford, Dorothy H, Edwards, J M B, Sweny, P, Hoffbrand, A V and Janossy, G. Studies on long-term T-cell-mediated immunity to Epstein-Barr virus in immunosuppressed renal allograft recipients. *Int. J. Cancer*, 1981, **28**, 705

Crawford, Dorothy H, Sweny, P, Edwards, J M B, Janossy, G and Hoffbrand, A V. Long-term T-cell-mediated immunity to Epstein-Barr virus in renal-allograft recipients receiving cyclosporin A. *Lancet*, 1981, i, 10

Croton, R S, Sykes, D, Treanor, J, Wake, P, Green, H T, Knowles, M A and Eilon, L A. The evaluation of cefuroxime in the prevention of postoperative infection. *Postgrad. med. J.*, 1981, 57, 363

Cruickshank, J G. The broiler chicken and campylobacters. Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981, pp. unnumb.

Cruickshank, J G. Prophylactic antibiotics and infection control. Pap. XI annu. Symp. I.C.N.A., Bristol, 1981, [1981], p. 31

Cruickshank, J G and Anderson, A W. Tuberculosis in England: current problems. Aust. Microbiol., 1981, 1, No. 5, p. 3

Cruickshank, J G, Hart, R J C, George, M and Feest, T G. Fatal streptococcal septicaemia. Brit. med. J., 1981, 282, 1944

Cubitt, W D and McSwiggan, D A. Calicivirus gastroenteritis in North West London. Lancet, 1981, ii, 975

Cubitt, W D, McSwiggan, D A, Thaker, U and Darougar, S. A comparison of the efficiency of human embryo intestine, Hep 2 cells, and human embryo kidney cells for the primary isolation of ophthalmic viruses. Brit. J. Ophthal., 1981, 65, 546

Cubitt, W D, Pead, P J and Saeed, A A G. A new serotype of calicivirus associated with an outbreak of gastroenteritis in a residential home for the elderly. J. clin. Path., 1981, 34, 924

Curtis, M A. Cellular fatty acid profiles of Campylobacter. Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981, pp. unnumb.

Curtis, M A. Cellular fatty acid profiles of Campylobacter. FIMLS thesis, 1981

D'Amato, R F, Holmes, B and Bottone, E J. The systems approach to diagnostic microbiology. CRC Crit. Rev. Microbiol., 1981, 9, 1

Darai, G, Flugel, R M, Zoller, L, Matz, B, Krieg, A, Gelderblom, H, Delius, H and Leach, R H. The plaque-forming factor for mink lung cells present in cytomegalovirus and herpes-zoster virus stocks identified as Mycoplasma hyorhinis. J. gen. Virol., 1981, 55, 201

Davidson, D C, Blundell, V and Roberts, C. Bacteriological quality of homologous breast milk. (Letter) Arch. Dis. Childh., 1981, 56, 316

Davies, Joan R. Campylobacter jejuni - the serological approach. Oxoid Cult., 1981, 2, No. 2, p. 4

Day, N P, Scotland, S M and Rowe, B. Comparison of an HEp-2 tissue culture test with the Sereny test for detection of enteroinvasiveness in Shigella spp. and Escherichia coli. J. clin. Microbiol., 1981, 13, 596

Dennis, P J L, Taylor, J A and Barrow, G I. The isolation of Legionella pneumophila from environmental water samples. (Abstract) Trans. R. Soc. trop. Med. Hyg., 1981, 75, 884

Dennis, P J L, Taylor, J A and Barrow, G I. Phosphate buffered, low sodium chloride blood agar medium for Legionella pneumophila. (Letter) Lancet, 1981, ii, 636

De Saxe, Maureen J, Crees-Morris, J A, Marples, R R and Richardson, J F. Evaluation of current phage-typing systems for coagulase-negative staphylococci. Zbl. Bakt., I. Abt., 1981, Suppl. 10, 197

De Saxe, Maureen J and Porthouse, A. Studies on the in-vitro transfer of resistance to gentamicin in Staphylococcus aureus. Zbl. Bakt., I. Abt., 1981, Suppl. 10, 565

Dijkhuizen, L, Keijer, L, Waddell, V J C, Primrose, S B, Barstow, D and Atkinson, A. The rapid isolation of mutants of some Gram-positive bacteria. FEMS Microbiol. Lett., 1981, 12, 51

Dolly, J O, Tse, C-K, Black, J D, Williams, R S, Wray, D, Gwilt, M, Hambleton, P and Melling, J. Botulinum neurotxin type A as a probe for studying neurotransmitter release. In: Biomedical aspects of botulism, edited by G E Lewis, p. 47. New York, Academic Press, 1981

Donovan, T J. Experience of serotyping Vibrio cholerae. (Abstract) Soc. gen. Microbiol. Quart., 1981, 8, 183

Dulake, C, Adam, G, Allenby, F, Anderson, A R, Clark-Jones, A and Cure, S M F. A new citrated formulation of nalidixic acid (Mictral U.K.) for the treatment of acute cystitis. J. int. med. Res., 1981, 9, 177

Easmon, C S F, Hastings, M J G, Clare, A J, Bloxham, B, Marwood, R, Rivers, R P A and Stringer, J. Nosocomial transmission of group B streptococci. Brit. med. J., 1981, 283, 459

Edwards, Joan M B, Kessel, I, Gardner, S D, Eaton, B R, Pollock, T M, Fleck, D G, Gibson, P E, Woodroof, M and Porter, A D. A search for a characteristic illness in children with serological evidence of viral or toxoplasma infection. J. Infect., 1981, 3, 316

Efstratiou, Androulla, Colman, G, Lightfoot, N F and Cruickshank, J G. Streptococcal pyoderma in a military training establishment. Abstr. VIII int. Symp. Strep. strep. Dis. Lund, 1981, p. 2

Ellis, D S, Southee, T, Lloyd, G, Platt, G S, Jones, N, Stamford, S, Bowen, E T W and Simpson, D I H. Congo/Crimean haemorrhagic fever virus from Iraq 1979. I. Morphology in BHK21 cells. Arch. Virol., 1981, 70, 189

Ellwood, D C, Abbas, S, Holme, T, Linder, L and Sund, M-L. pH fall profiles by glycolysing cells of Streptococcus mitis ATCC 903. (Abstract) Soc. gen. Microbiol. Quart., 1981, 8, 117

Everall, P H. Choosing an oven or incubator. Med. Lab. World, 1981, Aug., p. 26

Everall, P H. Direct air displacement by steam (DADS) in the sterilisation of infected laboratory waste. Med. Lab. World, 1981, 5, No. 1, p. 33

Farmer, J J, Fanning, G R, Huntley-Carter, G P, Holmes, B, Hickman, F W, Richard, C and Brenner, D J. Kluyvera, a new (redefined) genus in the family Enterobacteriaceae: identification of Kluyvera ascorbata sp. nov. and Kluyvera cryocrescens sp. nov. in clinical specimens. J. clin. Microbiol., 1981, 13, 919

Farrag, Nadia S N. Immunological methods for the rapid diagnosis of bacterial meningitis in children. University of London, PhD thesis, 1981

Farrell, I D. Collection of specimens for bacteriological investigation. Med. int. (U.K. ed.), 1981, 1, 93

Farrell, I D, Ball, A P, Brookes, G, Davey, P G, Muscroft, T J and Gonda, I. The absorption of amoxycillin after gastric surgery. (Letter) J. antimicrob. Chemother., 1981, 7, 110

Farrell, I D and Brookes, G R. The laboratory efficacy of amoxycillin and clavulanic acid combinations. In: Augmentin: clavulanate-potentiated amoxycillin. Proceedings of the first symposium, [Burgenstock, Switzerland], 1980, edited by G N Rolinson and A Watson, p. 54. Amsterdam, Excerpta Medica, 1980

Fell. H W and Nagington, J. Screening test for hepatitis. (Letter) Brit. dent. J., 1981, **151**, 175

Fisher-Hoch, Susan P, Bartlett, C L R, Harper, G J, Lach, V H, Clark, S P, Jones, B P C and Thomas, J A. Legionnaires' disease at Kingston Hospital. (Letter) Lancet, 1981, i, 1154

Fisher-Hoch, Susan P, Bartlett, C L R, Tobin, J O'H, Gillett, M B, Nelson, A M, Pritchard, J E, Smith, M G, Swann, R A, Talbot, J M and Thomas, J A. Investigation and control of an outbreak of legionnaires' disease in a district hospital. Lancet, 1981, i, 932

Fitzgeorge, R B, Baskerville, A and Lander, K P. Experimental C. jejuni infection of Rhesus monkeys. Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981, pp. unnumb.

Fitzgeorge, R B, Baskerville, A and Lander, K P. Experimental infection of Rhesus monkeys with a human strain of Campylobacter jejuni. J. Hyg., Camb., 1981, **86**, 343

Fleck, D G. Toxoplasmosis. Arch. Dis. Childh., 1981, **56**, 494

Fraser, Cherry A M. Immune response of guinea-pigs to the opacity factor of group-A streptococci. Abstr. VIII int. Symp. Strep. strep. Dis., Lund, 1981, p. 75

Fraser, Cherry A M. The streptococcal opacity factor: its properties, antigenicity and distribution among strains of group-A streptococci. University of Sheffield, PhD thesis, 1981

Freeman, R. The aetiology, pathogenesis and prevention of prosthetic valve endocarditis. In: Towards safer cardiac surgery, edited by D B Longmore, p. 583. Lancaster, MTP Press, 1981

Frost, Jennifer A, Rowe, B, Vandepitte, J and Threlfall, E J. Plasmid characterisation in the investigation of an epidemic caused by multiply resistant Shigella dysenteriae type 1 in Central Africa. Lancet, 1981, ii, 1074

Galbraith, N S. The control of tuberculosis. In: Mycobacterial infections: selected abstracts from a scientific meeting of the British Society for the Study of Infection, London, 1979, edited by J S M Steen, p. 24. Horsham, CIBA Laboratories, 1981

Galbraith, N S. Epidemiology of infection in Britain today. Med. int. (U.K. ed.), 1981, **1**, No. 1, p. U10

Galbraith, N S. A national public health service. J. R. Soc. Med., 1981, **74**, 16

Galbraith, N S and Bartlett, C L R. Training in communicable disease epidemiology: the contribution of the Communicable Disease Surveillance Centre of the Public Health Laboratory Service. *Community Med.*, 1981, 3, 154

Galbraith, N S, Forbes, P and Tillett, H E. National surveillance of tetanus in England and Wales 1930-79. *J. Infect.*, 1981, 3, 181

Gallagher, P, Chadwick, P, Jones, D M and Turner, L. Acute pancreatitis associated with campylobacter infection. *Brit. J. Surg.*, 1981, **68**, 383

Gardner, P S. Rapid virus diagnosis. In: *Immunoassays for the 80s*, edited by A Voller, A Bartlett and D Bidwell, p. 353. Lancaster, MTP Press, 1981.

Gardner, P S. Virus infections of the respiratory tract. *Virus and Man (Geigy)*, 1981, No. 13, 55

Gardner, Sylvia D. The clinical aspects of reactivation of polyomaviruses during therapeutic immunosuppression. *Abstr. V int. Congr. Virol., Strasbourg, 1981*, p. 151

Garvey, R J P and Reed, T A G. Ophthalmia neonatorum due to *Branhamella (Neisseria) catarrhalis*: case reports. *Brit. J. vener. Dis.*, 1981, **57**, 346

Gettner, Seyedeh M M and Mackenzie, D W R. Responses of human peripheral lymphocytes to soluble and insoluble antigens of *Candida albicans*. *J. med. Microbiol.*, 1981, **14**, 333

Gibson, Patricia E, Field, A M, Gardner, S D and Coleman, D V. Occurrence of IgM antibodies against BK and JC polyomaviruses during pregnancy. *J. clin. Path.*, 1981, **34**, 674

Gilbert, H J and Jack, G W. The effect of proteinases on phenylalanine ammonia-lyase from the yeast *Rhodotorula glutinis*. *Biochem. J.*, 1981, **199**, 715

Gilbert, H J and Jack, G W. Proteolysis of phenylalanine ammonia lyase (PAL) of *Rhodotorula glutinis*. (Abstract) *Soc. gen. Microbiol. Quart.*, 1981, 8, 273

Gilbert, R J, Turnbull, P C B, Parry, J M and Kramer, J M. *Bacillus cereus* and other *Bacillus* species: their part in food poisoning and other clinical infections. In: *The aerobic endospore-forming bacteria: classification and identification*, edited by R C W Berkeley and M Goodfellow, p. 297. London, Academic Press, 1981. (Society for General Microbiology Special Publication No. 4)

Glynn, A A. The Wright-Fleming Institute. *Lab. Pract.*, 1981, **30**, 794

Glynn, A A and Ison, C A. Immunological specificity of secretory IgA. (Letter) *Lancet*, 1981, ii, 808

Gosling, Paula J H. Was it benign myalgic encephalomyelitis? (Letter) *Lancet*, 1981, i, 221

Gould, E A, Chanas, A C, Clegg, C and Varma, M G R. Some characteristics of monoclonal antibodies produced against Sindbis virus. *Abstr. V.*

Congr. Virol., Strasbourg, 1981, p. 43

Graham, D R, Anderson, R L, Ariel, F E, Ehrenkranz, N J, Rowe, B, Boer, H R and Dixon, R E. Epidemic nosocomial meningitis due to Citrobacter diversus in neonates. J. infect. Dis., 1981, **144**, 203

Greatorex, F B. CPSM: an anachronism in micro-chip age. (Letter) Med. World, 1981, **119**, No. 3, p. 13

Greatorex, F B. The graduate pathway. (Letter) Gaz. Inst. med. Lab. Sci., 1981, 25, 463

Greatorex, F B. [The 'private sector' and the NHS.] (Letter) Med. Technologist, 1981, **11**, No. 5, p. 61

Greene, L A and Wallace, J G. The question of potability. In: Anglian Water Authority/Ness symposium on the Trent - Witham Ancholme potability study, Loughborough, 1981, Pap. No. 19

Greenwood, D, Eley, A, Pearson, N J and O'Grady, F. In-vitro activity of the novel oxa-beta-lactam antibiotic moxalactam (LY 127935) against dense populations of selected Gram-negative bacilli. J. antimicrob. Chemother., 1981, 7, 353

Grilli, E A and Davies, J R. Influenza B at Christ's Hospital: natural antibody to influenza B estimated by radial haemolysis. J. Hyg., Camb., 1981, **87**, 211

Gross, R J, Rowe, B, Cheasty, T and Thomas, L V. Increase in drug resistance among Shigella dysenteriae, Sh. flexneri, and Sh. boydii. Brit. med. J., 1981, **283**, 575

Gross, R J, Rowe, B, Sechter, I, Cahan, D and Altman, G. Antigenic scheme for Citrobacter koseri (syn. C. diversus, Levinea malonatica): three new antigens recognised in strains from Israel. J. Hyg., Camb., 1981, **86**, 111

Gump, D, Caul, E O, Eade, O, Greenberg, H, Kapikian, A, MacPherson, B, Mitchell, P, Parent, K, Richmond, S J and Beeken, W. Lymphocytoxic and microbial antibodies in Crohn's disease and matched controls. Antonie van Leeuwenhoek, 1981, **47**, 455

Hallas, Gillian and Widdowson, J P. Antibody to hyaluronidase of streptococci of Lancefield group C and group G. Abstr. VIII int. Symp. Strep. strep. Dis., Lund, 1981, p. 81

Hambleton, P, Baskerville, A, Wade, J J and Bailey, N E. Some normal clinical chemistry values for cerebrospinal fluid of rhesus monkey (Macaca mulatta). Lab. Anim., 1981, **15**, 181

Hambleton, P, Capel, B J, Bailey, N, Heron, N, Crooks, A J, Melling, J, Tse, C-K and Dolly, J O. Production, purification and toxoiding of Clostridium botulinum type A toxin. In: Biomedical aspects of botulism, edited by G E Lewis, p. 247. New York, Academic Press, 1981

Hambleton, P, Tse, V C K, Capel, B J, Dolly, J O and Melling, J. Purification and characterisation of Cl. botulinum type A neurotoxin. (Abstract) Proc. World Congr. foodb. Infect. Intoxicat., Berlin, 1980, p. 62

Hammond, P M, Scawen, M D and Price, C P. Enzyme based paracetamol estimation. (Letter) Lancet, 1981, i, 391

Harper, G J. Contamination of the environment by special purpose centrifuges used in clinical laboratories. J. clin. Path., 1981, **34**, 1114

Harper, G J. Design criteria for Category A laboratories in the U K and their commissioning. Abstr. XXIV biol. Saf. Conf., Athens, Ga, 1981, p. 10

Hart, R J C. Immunization. Clinics Obstet. Gynec., 1981, **8**, 421

Harvey, R W S and Price, T H. Comparison of selenite F, Muller-Kauffmann tetrathionate and Rappaport's medium for salmonella isolation from chicken giblets after pre-enrichment in buffered peptone water. J. Hyg., Camb., 1981, **87**, 219

Harvey, R W S and Price, T H. Observations on infections associated with South Wales natural waters. J. appl. Bact., 1981, **51**, 369

Hasleton, P S, Curry, A and Rankin, E M. Pneumocystis carinii pneumonia: a light microscopical and ultrastructural study. J. clin. Path., 1981, **34**, 1138

Hearn, Veronica M and Mackenzie, D W R. Analysis of wall antigens of Aspergillus fumigatus by two-dimensional immunoelectrophoresis. J. med. Microbiol., 1981, **14**, 119

Heimer, G V, McSwiggan D A and Shafi, M S. Rapid reading and recording of complement fixation tests by means of a microtitre plate scanner. J. clin. Path., 1981, **34**, 99

Hewitt, J H, Lightfoot, N F and Mann, P G. Microbiology of 'slush puppies'. (Letter) Environm. Hlth, 1981, **89**, 311

Heymann, C S, Turk, D C and Rotimi, V O. Multiple antibiotic resistance in Haemophilus influenzae. (Letter) Lancet, 1981, i, 553

Hildreth, C, Thomas, M E M and Ridgway, G L. Rotavirus infection in an obstetric unit. Brit. med. J., 1981, **282**, 231

Hill, L R. Bacteria. ASLIB Proc., 1981, **33**, 137

Hill, L R. The importance and applications of culture collections. KUKEM Derg., 1981, **4**, No. 2, p. 7

Hill, L R. Preservation of microorganisms. In: Essays in applied microbiology, edited by J R Norris and M H Richmond, p. 2/1. Chichester, Wiley, 1981

Hill, L R. A survey of the variety of usages of pathogenic bacteria supplied by the NCTC. Abstr. IV int. Conf. Cult. Collect., Brno, 1981, p.5

Hill, L R. Taxonomy of the staphylococci. In: The staphylococci: proceedings of the Alexander Ogston centennial conference, edited by A Macdonald and G Smith, p. 33. Aberdeen University Press, 1981

Hill, L R and Owen, R J. The National Collection of Type Cultures. Abstr. IV int. Conf. Cult. Collect., Brno, 1981, p. P1

Hill, M J. Bile acids in colorectal carcinogenesis. In: Gastrointestinal cancer: endogenous factors, edited by W R Bruce, P Correa, M Lipkin, S R Tannenbaum and T D Wilkins, p. 365. Cold Spring Harbor Laboratory, 1981. (Banbury Report 7)

Hill, M J. Diet and the human intestinal bacterial flora. Cancer Res., 1981, **41**, 3778

Hill, M J. Dietary fat and human cancer. Proc. Nutr. Soc., 1981, **40**, 15

Hill, M J. Endogenous carcinogens. Practitioner, 1981, **225**, 803

Hill, M J. Metabolic epidemiology of large bowel cancer. In: Gastrointestinal cancer 1, edited by J J DeCosse and P Sherlock, p. 187. The Hague, Martinus Nijhoff, 1981

Hill, M J. Neoplasms: aetiology. In: Colorectal disease: an introduction for surgeons and physicians, edited by J P S Thomson, R J Nicholls and C B Williams, p. 232. London, Heinemann, 1981

Hill, M J. Nitrates and bacteriology. Are these important etiological factors in gastric carcinogenesis? In: Gastric cancer, edited by J W L Fielding, C E Newman, C H J Ford and B G Jones, p. 35. Oxford, Pergamon Press, 1981. (Advances in the Biosciences 32)

Hill, M J. Why I would take cimetidine. World Med., 1981, **16**, No. 10, p.38

Hoffman, P N. Disinfectant-impregnated cloths in hospital laboratories. (Letter) J. Hosp. Infect., 1981, **2**, 391

Hoffman, P N, Death, J E and Coates, D. The stability of sodium hypochlorite solutions. In: Disinfectants: their use and evaluation of effectiveness, edited by C H Collins, M C Allwood, S F Bloomfield and A Fox, p. 77. London, Academic Press, 1981. (Society for Applied Microbiology Technical Series No. 16)

Holman, R L, Hurley, R, Kertesz, A, Shanson, D and Taylor, C E D. [Visit to China.] (Letter) J. clin. Path., 1981, **34**, 817

Holmes, B and Ahmed, M S. Group EF-4: a Pasteurella-like organism. In: Haemophilus, Pasteurella and Actinobacillus, edited by M Kilian, W Frederiksen and E L Biberstein, p. 161. London, Academic Press, 1981

Holmes, B and Owen, R J. Emendation of the genus Flavobacterium and the status of the genus: developments after the 8th edition of Bergey's Manual. In: The Flavobacterium-Cytophaga group: proceedings of the international symposium on yellow-pigmented Gram-negative bacteria of the Flavobacterium-Cytophaga group, [Braunschweig], 1980, edited by H Reichenbach and O B Weeks, p. 17. Weinheim, Verlag Chemie, 1981

Holmes, B, Owen, R J and Weaver, R E. Flavobacterium multivorum, a new species isolated from human clinical specimens and previously known as group IIk, biotype 2. Int. J. syst. Bact., 1981, **31**, 21

Holmes, B and Roberts, P. The classification, identification and nomenclature of agrobacteria incorporating revised descriptions for each of Agrobacterium tumefaciens (Smith and Townsend) Conn 1942, Agrobacterium rhizogenes (Riker et al.) Conn 1942, and Agrobacterium rubi (Hildebrand)

Starr and Weiss 1943. J. appl. Bact., 1981, **50**, 443

Hooper, W L. Microbiological testing of non-sterile pharmaceuticals. (Abstract) J. appl. Bact., 1981, **51**, vi

Hudson, M J, Borriello, S P and Hill, M J. Elemental diets and the bacterial flora of the gastrointestinal tract. In: Elemental diets, edited by R I Russell, p. 105. Boca Raton, Fla, CRC Press, 1981

Hudson, M J, Elliott, P R, Burnham, W R, Hill, M J and Lennard-Jones, J E. The microbial flora of faeces and rectal mucosa in Crohn's disease before and during antimicrobial chemotherapy. Abstr. XII int. Congr. Chemother., Florence, 1981, p. 105

Hughes, H P A. Characterization of the circulating antigen of Toxoplasma gondii. Immunol. Lett., 1981, **3**, 99

Hughes, H P A and Balfour, A H. An investigation of the antigenic structure of Toxoplasma gondii. Parasite Immunol., 1981, **3**, 235

Hughes, P, Lowe, C R and Sherwood, R F. Affinity chromatography using metal ions. U.K. Patent Application 8112925

Hughes, Victoria M, Datta, N and Faiers, M C. Interhospital spread of a multiply resistant klebsiella. Brit. med. J., 1981, **282**, 696

Hunter, A M, Campbell, I A, Jenkins, P A and Smith, A P. Treatment of pulmonary infections caused by mycobacteria of the Mycobacterium avium-intracellulare complex. Thorax, 1981, **36**, 326

Hunter, P D, Hunter, J R, Bowden, G H, Hamilton, I R, Hardie, J M and Ellwood, D C. The influence of growth rate and nutrient limitation on the bacterial composition and metabolic activity of a mixed culture of oral bacteria grown in a chemostat. (Abstract) Trans. R. Soc. trop. Med. Hyg., 1981, **75**, 885

Ingham, H R, Sisson, P R, Eisenstadt, R L, Sprott, M S, Byrne, P O and Selkon, J B. Enhancement of activity of metronidazole by Esherichia coli under sub-optimal anaerobic conditions. J. antimicrob. Chemother., 1981, **8**, 475

Ingham, H R, Sisson, P R, Middleton, R L, Narang, H K, Codd, A A and Selkon, J B. Phagocytosis and killing bacteria in aerobic conditions. J. med. Microbiol., 1981, **14**, 391

Islam, A K M S. Primary carrier sites of group B streptococci in pregnant women correlated with serotype distributions and maternal parity. J. clin. Path., 1981, **34**, 78

Ison, Catherine A, Bellinger, C and Glynn, A A. Meningococci or transformed gonococci? (Abstract) Soc. gen. Microbiol. Quart., 1981, **8**, 125

Ison, Catherine A, Hadfield, S G and Glynn, A A. Enzyme-linked immunosorbent assay (ELISA) to detect antibodies in gonorrhoea using whole cells. J. clin. Path., 1981, **34**, 1040

Ivory-Hollingsworth, W R. Quality control in microbiology: past and present. I.M.L.S.N. Reg. Microbiol. Grp Proc. Meet., 1980, 1981, pp. unnumb.

Jack, G W and Gilbert, H J. The use of phenylalanine ammonia lyase in the treatment of phenylketonuria. (Abstract) *Trans. R. Soc. trop. Med. Hyg.*, 1981, **75**, 885

Jenkins, P A. Behind the fridge. (Letter) *Nature, Lond.*, 1981, **289**, 107

Jenkins, P A. The epidemiology of opportunist mycobacterial infections in Wales, 1952-1978. *Rev. infect. Dis.*, 1981, **3**, 1021

Jenkins, P A. Lipid analysis for the identification of mycobacteria: an appraisal. *Rev. infect. Dis.*, 1981, **3**, 862

Jenkins, P A. Nontuberculous mycobacteria and disease. *Europ. J. resp. Dis.*, 1981, **62**, 69

Jenkins, P A. Pulmonary infections with opportunist mycobacteria. In: *Mycobacterial infections: selected abstracts from a scientific meeting of the British Society for the Study of Infection, London, 1979*, edited by J S M Steen, p. 17. Horsham, CIBA Laboratories, 1981

Jephcott, A E. Travellers' ills at home and abroad. *Update*, 1981, **22**, 1935

Jephcott, A E, Dickgiesser, N and McClean, A N. Penicillinase-producing gonococci in Britain. *Lancet*, 1981, ii, 247

Johnston, Nafra A. Evaluation of the coagglutination test for the identification of *Neisseria gonorrhoeae* in primary cultures. *Brit. J. vener. Dis.*, 1981, **57**, 315, also published as WHO/VDT/RES/GON/81.134, 1981. (World Hlth Org. working document)

Johnston, Nafra A, Kolator, B and Seth, A D. A survey of beta-lactamase-producing gonococcal isolates reported in the United Kingdom 1979-80: the present trend. *Lancet*, 1981, i, 263, also published as WHO/VDT/RES/GON/81.133, 1981. (World Hlth Org. working document)

Jones, D M. Introduction. [Session VI. Skin and soft-tissue infections.] In: *Augmentin: clavulanate-potentiated amoxycillin. Proceedings of the first symposium, [Burgenstock, Switzerland], 1980*, edited by G N Rolinson and A Watson, p. 213. Amsterdam, Excerpta Medica, 1980

Jones, D M. Serotypes of meningococci causing disease in England and Wales, 1978-9. (Letter) *J. clin. Path.*, 1981, **34**, 818

Jones, D M, Abbott, J D, Eldridge, J and Sutcliffe, E M. Campylobacter serotyping and epidemiology. (Letter) *Lancet*, 1981, i, 386

Jones, D M and Eldridge, J. Meningococcal disease in England and Wales 1978-79: a change in the serotype pattern. *J. Infect.*, 1981, **3**, 134

Jones, D M and Robinson, D A. Occupational exposure to *Campylobacter jejuni* infection. (Letter) *Lancet*, 1981, i, 440

Jones, D M and Robinson, D A. Sero-epidemiological studies of *Campylobacter jejuni* infection. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Jones, D M, Robinson, D A and Eldridge, J. Serological studies in two outbreaks of *Campylobacter jejuni* infection. *J. Hyg., Camb*., 1981, **87**, 163

Jones, I M, Primrose, S B, Robinson, A and Ellwood, D C. Effect of growth rate and nutrient limitation on the transformability of *Escherichia coli* with plasmid deoxyribonucleic acid. *J. Bact*., 1981, **146**, 841

Jones, P H and Willis, A T. A large milk-borne outbreak of campylobacter enteritis in Luton. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumnb.

Jones, P H, Willis, A T, Robinson, D A, Skirrow, M B and Josephs, D S. Campylobacter enteritis associated with the consumption of free school milk. *J. Hyg., Camb*., 1981, **87**, 155

Jones, Susan A, Thompson, Y C, Sherwood, R F, Atkinson, A and Melling, J. Stability of antibiotic resistance plasmids in *Bacillus subtilis* in continuous culture. *Abstr. annu. Meet. Amer. Soc. Microbiol., 1981*, p. 134

Jones, T O and Turnbull, P C B. Bovine mastitis caused by *Bacillus cereus*. *Vet. Rec*., 1981, **108**, 271

Karran, S J, Allen, S, Lewington, V, Seal, D V and Reeves, D. Cefuroxime prophylaxis in biliary surgery. *R. Soc. Med. int. Congr. Symp. Ser*., 1981, No. 38, 27

Keevil, C W, Williamson, M I, Marsh, P D and Ellwood, D C. An alternative sugar uptake system in oral streptococci involving a proton motive force. (Abstract) *Soc. gen. Microbiol. Quart*., 1981, **8**, 118

Kite, P. Myths and mysteries of the N.B.T. test. *I.M.L.S.N. Reg. Microbiol. Grp Proc. Meet., 1980*, 1981, pp. unnumb.

Kurtz, J B and Malic, A. Rubella-specific IgM detected by an antibody capture assay/ELISA technique. *J. clin. Path*., 1981, **34**, 1392

Kurtz, J B and Willis, M. Legionnaires' disease: some environmental aspects. (Abstract) *J. med. Microbiol*., 1981, **14**, Pxx

Lach, V H and Wright, A E. The testing of HEPA filters fitted to microbiological safety cabinets: a comparison of methods. *J. Hosp. Infect*., 1981, 2, 385

Leaper, Susan M and Owen, R J. Identification of catalase-producing *Campylobacter* species based on biochemical characteristics and on cellular fatty acid composition. *Curr. Microbiol*., 1981, **6**, 31

Lee, J V. Recent developments in the taxonomy of *Vibrio*, *Beneckea* and *Lucibacterium*. (Abstract) *Soc. gen. Microbiol. Quart*., 1981, **8**, 179

Lee, J V and Furniss, A L. The phage-typing of *Vibrio cholerae* serovar 01. In: *Acute enteric infections in children: new prospects for treatment and prevention*, edited by T Holme, J Holmgren, M H Merson and R Mollby, p. 119. Amsterdam, Elsevier/North-Holland, 1981

Lee, J V, Shread, P, Furniss, A L and Bryant, T N. Taxonomy and description of *Vibrio fluvialis* sp. nov. (synonym group F vibrios, group EF6). *J. appl. Bact*., 1981, **50**, 73

Lee, T W and Kurtz, J B. Serial propagation of astrovirus in tissue culture with the aid of trypsin. J. gen. Virol., 1981, **57**, 421

Le Minor, L, Bockemuhl, J and Rowe, B. Supplement No. XXIV (1980) au schema de Kauffmann-White. Ann. Microbiol., Paris, 1981, **132B**, 85

Levett, P N and Daniel, R R. Adhesions of vibrios and aeromonads to isolated rabbit brush borders. J. gen. Microbiol., 1981, **125**, 167

Lidwell, O M. Airborne bacteria and surgical infection. Amer. J. Med., 1981, **70**, 693, reprinted in Nosocomial infections, edited by R E Dixon, p. 128. New York, Yorke Medical Books, 1981

Lowe, C R, Clonis, Y D, Goldfinch, M J, Small, D A P and Atkinson, A. Some preparative and analytical applications of triazine dyes. Analyt. Chem. Symp., 1981, **9**, 389

Lowe, C R, Glad, M, Larsson, P-O, Ohlson, S, Small, D A P, Atkinson, A and Mosbach, K. High-performance liquid affinity chromatography of proteins on cibacron blue F3G-A bonded silica. J. Chromat., 1981, **215**, 303

Lowe, C R, Small, D A P and Atkinson, A. Some preparative and analytical applications of triazine dyes. Int. J. Biochem., 1981, **13**, 33

Macaulay, Margaret E. The IgM and IgC response to Bordetella pertussis vaccination and infection. J. med. Microbiol., 1981, **14**, 1

McBride, H M. The effect of growth conditions on total protein profiles of Campylobacter. Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981, pp. unnumb

McConnell, Moyra M, Smith, H R, Willshaw, G A, Field, A M and Rowe, B. Plasmids coding for colonization factor antigen I and heat-stable enterotoxin production isolated from enterotoxigenic Esherichia coli: comparison of their properties. Infect. Immun., 1981, **32**, 927

McDonald, T, Pearson, N J, Johnson, F and O'Grady, F W. Automated reading of the multipoint inoculated antibiotic sensitivity test. J. med. Engng Tech., 1981, 5, 243

Macfarlane, J T, Finch, R G, Laverick, A and Macrae, A D. Pittsburg pneumonia agent and legionellosis in Nottingham. Brit. med. J., 1981, **283**, 1222

Macfarlane, J T, Ward, M J, Banks, D C, Pilkington, R A and Finch, R G. Reducing risks from intravenous cannulae. Brit. med. J., 1981, **282**, 1838

Macfarlane, J T, Ward, M J, Banks, D C, Pilkington, R A and Finch, R G. Risks from cannulae used to maintain intravenous access. Brit. med. J., 1980, **281**, 1395

McKendrick, M W, Farrell, I D and Geddes, A M. Trimethoprim in enteric fever. Abstr. XII int. Congr. Chemother., Florence, 1981, p. 262

McKendrick, M W, Geddes, A M and Farrell, I D. Trimethoprim in enteric fever. Brit. med. J., 1981, **282**, 364

Mackenzie, D W R. Immunoassays in mycology. In: Immunoassays for the 80s, edited by A Voller, A Bartlett and D Bidwell, p. 441. Lancaster, MTP Press, 1981

Mackenzie, D W R and Hay, R J. Yeast infections in the UK. R. Soc. Med. int. Congr. Symp. Ser., 1981, No. 45, 11

Mackie, I A and Seal, D V. The questionably dry eye. Brit. J. Ophthal., 1981, 65, 2

Macrae, A D. Rabies virus and laboratory regulations. (Letter) Lancet, 1981, ii, 209

Mallinson, H, Sikotra, S and Arya, O P. Cultural method for large-scale screening for Chlamydia trachomatis genital infection. J. clin. Path., 1981, 34, 712

Manchee, R J, Broster, M G, Melling, J, Henstridge, R M and Stagg, A J. Bacillus anthracis on Gruinard Island. Nature, Lond., 1981, 294, 254

Marples, R R. Coagulase-negative staphylococci: classification and problems. In: Skin microbiology; relevance to clinical infection, edited by H I Maibach and R Aly, p. 13. New York, Springer, 1981

Marples, R R. Experimental staphylococcal infection in humans. In: The staphylococci: proceedings of the Alexander Ogston centennial conference, edited by A Macdonald and G Smith, p. 73. Aberdeen University Press, 1981

Marples, R R. Newer methods of quantifying skin bacteria. In: Skin microbiology: relevance to clinical infection, edited by H I Maibach and R Aly, p. 45. New York, Springer, 1981

Marples, R R. Taxonomic studies of staphylococci and micrococci. Zbl. Bakt., I Abt., 1981, Suppl. 10, 9

Marples, R R and Richardson, J F. Characters of coagulase-negative staphylococci collected for a collaborative phage-typing study. Zbl. Bakt., I Abt., 1981, Suppl. 10, 175

Maskell, Rosalind M. Gardnerella vaginalis and prostatitis. (Letter) Lancet, 1981, ii, 581

Maskell, Rosalind M. Should 'fastidious' organisms alter our approach to the treatment of urinary symptoms? J. antimicrob. Chemother., 1981, 7, 315

Mayon-White, R T. Hospital infection: education and organisation. Postgrad. Doct. (Mid. East), 1981, 4, 252

Mayon-White, R T. The incidence of neonatal group B streptococcal disease in Britain. Abstr. VIII int. Symp. Strep. strep. Dis., Lund, 1981, p. 135

Mayon-White, R T. Neonatal group B streptococcal infections. Pap. XI annu. Symp. I.C.N.A., Bristol, 1980, [1981], p. 29

Meers, P D. A dangerous place to be ill. Times Hlth Suppl., 1981, No. 3, 18

Meers, P D. Bacterial multiplication in hospital water. In: Symposium: hospital water supplies. Report of proceedings, Loughborough, 1981, 3 pp.

Meers, P D. Infection in hospitals. Brit. med. J., 1981, 282, 1246

Melling, J and Allner, K. The containment of microorganisms. In: *Essays in applied microbiology*, edited by J R Norris and M H Richmond, p. 11/1. Chichester, Wiley, 1981

Meyer, L, Jenkins, P A, Boye, J and Tobe, F M. Mycobacteriose pulmonaire a *Mycobacterium szulgai*. *Rev. franc. Mal. resp.*, 1979, **7**, 507

Morris, C A. Trends in microbiology work-loads in the National Health Service: England and Wales (1968-79). *Hlth Trends*, 1981, **13**, 8, also synopsis in *Gaz. Inst. med. Lab. Sci.*, 1981, **25**, 233

Mortimer, P P, Edwards, J M B, Porter, A D, Tedder, R S, Mace, J E and Hutchinson, A. Are many women immunized against rubella unnecessarily? *J. Hyg., Camb.*, 1981, **87**, 131

Mortimer, P P and Parry, J V. Anti-hepatitis-A-virus potency of immunoglobulin. (Letter) *Lancet*, 1981, i, 1364

Mortimer, P P, Parry, J V and Appleton, H. Diagnosis of recent hepatitis A infection: a comparison of two methods for detecting specific IgM. *J. Hyg., Camb.*, 1981, **86**, 71

Mortimer, P P, Tedder, R S, Hambling, M H, Shafi, M S, Burkhardt, F and Schilt, U. Antibody capture radioimmunoassay for anti-rubella IgM. *J. Hyg., Camb.*, 1981, **86**, 139

Mortimer, P P and Vandervelde, E M. Epidemiological evidence for the presence of non-A non-B hepatitis in England. (Abstract) *Med. Lab. Sci.*, 1981, **38**, 430

Mortimer, P P, Vandervelde, E M, Parry, J V, Cohen, B J and Tedder, R S. The anti-HBc IgM response in the acute and convalescent phases of acute hepatitis. *J. Infect.*, 1981, **3**, 339

Moss, Fiona M, McNicol, M W, McSwiggan, D A and Miller, D L. Survey of antibiotic prescribing in a district general hospital. I. Pattern of use. II. Lower respiratory tract infection. III. Urinary tract infection. *Lancet*, 1981, ii, 349, 407, 461

Nagington, J. Collection of specimens and their examination for viral and related infections. In: *Thoracic medicine*, edited by P Emerson, p. 239. London, Butterworths, 1981

Nagington, J. Cyclosporin A immunosuppression and Epstein-Barr antibody. (Letter) *Lancet*, 1981, ii, 196

Nagington, J. Observations on 10 years' HBs antigenaemia after renal transplantation. *J. clin. Path.*, 1981, **34**, 412

Nagington, J. Virus infections of the skin. *Virus and Man (Geigy)*, 1980, No. 8, 35

Nagington, J, Wreghitt, T G and Smith, D J. *Legionella pneumophila* serogroup 5 infections in the Cambridge area: a serological survey. *J. Infect.*, 1981, **3**, 18

Narang, H K. Comparative morphology of measles virus and paramyxovirus-like tubules in multiple sclerosis using ruthenium red stain. *Neuropath. appl. Neurobiol.*, 1981, **7**, 411

Narang, H K and Codd, A A. Frequency of preclumped virus in routine fecal specimens from patients with acute nonbacterial gastroenteritis. J. clin. Microbiol., 1981, **13**, 982

Nichols, W W, Curtis, G D W and Johnston, H H. Choice of buffer anion for the assay of adenosine 5'-triphosphate using firefly luciferase. Analyt. Biochem., 1981, **114**, 396

Nichols, W W, Curtis, G D W and Johnston, H H. The identity and properties of firefly luciferase inhibitors in urine. Analyt. Biochem., 1981, **114**, 433

Nichols, W W, Curtis, G D W and Johnston, H H. Inhibitors of firefly luciferase in clinical urine specimens. In: Bioluminescence and chemiluminescence: basic chemistry and analytical applications, edited by M A DeLuca and W D McElroy, p. 485. New York, Academic Press, 1981

Noah, N D. Foodborne outbreaks of hepatitis A. (Abstract) Med. Lab. Sci., 1981, **38**, 428

Noah, N D. Hospital infection: food poisoning and salmonellosis conveyed by hospital food. Postgrad. Doct. (Mid. East), 1981, **4**, 458

Noah, N D. Influenza A in man, animals and birds: relationships and transmission. Flu Rev., 1981, No. 4, 2

Noah, N D. Medicine and the media: [Legionnaires' disease]. Brit. med. J., 1981, **283**, 1051

Noah, N D. Medicine and the media: [whooping cough]. Brit. med. J., 1981, **283**, 304

Noah, N D. The wider role of an epidemiologist in disease prevention after investigation of a local outbreak of hepatitis B from tattooing. (Abstract) J. Epidem. Community Hlth, 1981, **35**, 152

Noah, N D and Roberts, D. Preventing food poisoning by bacterial toxins. (Letter) Brit. med. J., 1981, **283**, 497

Noble, W C, Knowles, W A, Porter, A D, Porter, A A and Gardner, S D. Herpes simplex virus and eczematous skin. Brit. J. Derm., 1981, **105**, 475

Oram, J D and Downing, R G. Molecular cloning of cytomegalovirus-specific DNA fragments. In: International workshop on herpes viruses, Bolgna, 1981, edited by A S Kaplan, M LaPlaca, F Rapp and B Roizman, p. 15. Bologna, Esculapio Publishing Company, 1981

Owen, R J. Problems in the maintenance and supply of hazardous bacteria: UK practices. Abstr. IV int. Conf. Cult. Collect., Brno, 1981, p. 26

Owen, R J and Holmes, B. Identification and classification of Flavobacterium species from clinical sources. In: The Flavobacterium-Cytophaga group: proceedings of the international symposium on yellow-pigmented Gram-negative bacteria of the Flavobacterium-Cytophaga group, [Braunschweig], 1980, edited by H Reichenbach and O B Weeks, p. 39. Weinheim, Verlag Chemie, 1981

Owen, R J and Leaper, S M. Base composition, size and nucleotide sequence

similarities of genome deoxyribonucleic acids from species of the genus *Campylobacter*. *FEMS Microbiol. Lett*., 1981, **12**, 395

Owen, R W and Leaper, S M. The characteristics of type and reference cultures of *Campylobacter* species held in the National Collection of Type Cultures (NCTC). *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Owen, R W, Thompson, M H and Hill, M J. The identification of bacterial metabolites of chenodeoxycholic acid by GC-mass spectrometry. (Abstract) *Biochem. Soc. Trans*., 1981, **9**, 302P

Palleroni, N J and Holmes, B. *Pseudomonas cepacia* sp. nov., nom. rev. *Int. J. syst. Bact*., 1981, **31**, 479

Palmer, S R, Andrews, B E and Major, R. A common-source outbreak of ornithosis in veterinary surgeons. *Lancet*, 1981, ii, 798

Palmer, S R, Jephcott, A E, Rowland, A J and Sylvester, D G H. Person-to-person spread of *Salmonella typhimurium* phage type 10 after a common-source outbreak. *Lancet*, 1981, i, 881

Paradinas, F J, Davies, D R, Supran, E M, Viola, L and Marigold, J H. Histopathology and localization of viral antigens in the liver of HB_sAg positive homosexuals. *Histopathology*, 1981, **5**, 623

Parry, J V. Hepatitis A infection: guidelines for development of satisfactory assays for laboratory diagnosis. *Med. Lab. Sci*., 1981, **38**, 303

Partridge, J W, Flewett, T H and Whitehead, J E M. Congenital rubella affecting an infant whose mother had rubella antibodies before conception. *Brit. med. J*., 1981, **282**, 187

Pattman, R S, Sprott, M S and Moss, T R. Evaluation of a culture slide in the diagnosis of vaginal candidosis. *Brit. J. vener. Dis*., 1981, **57**, 67

Pead, Linda J and Maskell, R M. Urinary tract infection in adult men. *J. Infect*., 1981, **3**, 71

Pead, P J. Investigation of humoral antibody response by agglutination test in urinary tract infection associated with *Staphylococcus saprophyticus*. *University of Surrey, MSc thesis*, 1981

Pearson, A D. Variations in human response to campylobacters. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Pearson, A D, Drake, D P, Brookfield, D, Suckling, W G, Knill, M J, Ware, E and Knott, J R. Campylobacter infections in patients presenting with diarrhoea, mesenteric adenitis and appendicitis. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Pearson, A D, Knill, M J and Suckling, W G. Campylobacters from water. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Pegram, R G, Roeder, P L, Hall, M L M and Rowe, B. Salmonella in livestock and animal by-products in Ethiopia. *Trop. Anim. Hlth Prod*., 1981, **13**, 203

Pepper, E A, Melling, J and Berkeley, R C W. Studies on the effect of inhibition of lipid biosynthesis by cerulenin on the production of staphylococcal enterotoxin A. *Zbl. Bakt., I Abt*., 1981, Suppl. 10, 393

Perks, Elizabeth M, Mayon-White, R T, Slack, M P E and Saunders, F C. The epidemiology of *Streptococcus pyogenes* in Oxfordshire 1970-1980. *Abstr. VIII int. Symp. Strep. strep. Dis., Lund, 1981*, p. 1

Pether, J V S. Surgeons carrying hepatitis A. (Letter) *Lancet*, 1981, i, 1260

Phillips, K D. Gli antibiotici come agenti selettivi in batteriologia anaerobica. *Argomenti Microbiol., (Oxoid Ital*.), 1981, No. 2, 9, translated from Antibiotics as selective agents in anaerobic bacteriology. *Oxoid Cult*., 1979, Mar., p. 3

Phillips, K D. Some techniques for the rapid presumptive diagnosis of sepsis due to non-sporing anaerobes. In: *Les anaerobies: microbiologie - pathologie. Symposium, Paris, 1980*, p. 52. Paris, Masson, 1981

Phillips, K D and Rogers, P A. Rapid detection and presumptive identification of *Clostridium difficile* by *p*-cresol production on a selective medium. *J. clin. Path*., 1981, 34, 642

Phillips, K D and Willis, A T. Appraisal in the diagnostic laboratory of three commercially available anaerobic cabinets. *J. clin. Path*., 1981, 34, 1110

Pilsworth, R. Risks from cannulae used to maintain intravenous access. (Letter) *Brit. med. J*., 1981, 282, 222

Pinegar, J A. Comparison of calcium alginate swab-rinse technique and a commercially available agar contact slide for monitoring bacteria on work surfaces and equipment. (Abstract) *J. appl. Bact*., 1981, 51, xxiii

Pinegar, J A and Armstrong, R. Salmonellae and other organisms in processed elder. *Environm. Hlth*, 1981, 89, 120

Pitcher, D G. *Corynebacterium* and related genera of the normal human skin. *Hautarzt*, 1981, 32, Suppl. V, 273

Pitt, T L. A comparison of flagellar typing and phage typing as means of subdividing the O groups of *Pseudomonas aeruginosa*. *J. med. Microbiol*., 1981, 14, 261

Pitt, T L. Preparation of agglutinating antisera specific for the flagellar antigens of *Pseudomonas aeruginosa*. *J. med. Microbiol*., 1981, 14, 251

Platt, G S, Southee, T, Jones, N, Bowen, E T W, Simpson, D I H, Ellis, D S and Stamford, S. Congo-Crimea haemorrhagic fever in Iraq, 1979. (Abstract) *Trans. R. Soc. trop. Med. Hyg*., 1981, 75, 887

Polakoff, Sheila. Hepatitis in dialysis units in the United Kingdom: a Public Health Laboratory Service survey. *J. Hyg., Camb*., 1981, 87, 443

Poulter, N, Gabriel, R, Porter, K A, Bartlett, C L R, Kershaw, M, McKendrick, G D W and Venkataraman, R. Acute interstitial nephritis complicating Legionnaires' disease. *Clin. Nephrol*., 1981, 15, 216

Price, C P, Hammond, P M and Scawen, M D. An enzymic method for the measurement of paracetamol. (Abstract) *J. clin. Chem. clin. Biochem.*, 1981, **19**, 806

Primrose, S B, Jones, I M, Derbyshire, P, Robinson, A and Ellwood, D C. Derivatives of plasmid pBR322 which are stably maintained in chemostat culture. (Abstract) *Soc. gen. Microbiol. Quart.*, 1981, **8**, 99

Quaife, R A and Lutwyche, P. *Microsporum cookei* as the suspected cause of ringworm in a dog. *Vet. Rec.*, 1981, **109**, 311

Rashid, H, Morley, A R, Ward, M K, Kerr, D N S and Codd, A A. Hepatitis B infection in glomerulonephritis. *Brit. med. J.*, 1981, **283**, 948

Razi, M H H, Park, R W A and Skirrow, M B. Two new tests for differentiating between strains of *Campylobacter*. *J. appl. Bact.*, 1981, **50**, 55

Reilly, Sheena, Timmis, P, Beeden, A G and Willis, A T. Possible role of the anaerobe in tonsillitis. *J. clin. Path.*, 1981, **34**, 542

Ribeiro, C D. Prophylactic erythromycin for whooping-cough contacts. (Letter) *Lancet*, 1981, i, 951

Richardson, S A, Brookfield, D S K, French, T A and Gray, J. Pseudomembraneous colitis in a 5-week-old infant. *Brit. med. J.*, 1981, **283**, 1510

Richmond, Shirley J and Stirling, P. Localization of chlamydial group antigen in McCoy cell monolayers with *Chlamydia trachomatis* or *Chlamydia psittaci*. *Infect. Immun.*, 1981, **34**, 561

Richold, J C. [Infection control.] (Letter) *Med. Lab. World*, 1981, Dec., p. 11

Roberts, Diane. Factors contributing to outbreaks of bacterial food poisoning in England and Wales. *Proc. VIII int. Symp. World Ass. vet. Food Hyg., Dublin, 1981*, p. 290

Robertson, M H, Clarke, I R, Coghlan, J D and Gill, O N. Leptospirosis in trout farmers. *Lancet*, 1981, ii, 626

Robinson, A, Hawkins, D C, Eckersley, B J, Moody, G R G and Irons, L I. The nature of the mouse protective antigens of *Bordetella pertussis*. (Abstract) *Soc. gen. Microbiol. Quart.*, 1981, **8**, 116

Robinson, A, Hawkins, D C and Irons, L I. The preparation of distinct protective antigens from *Bordetella pertussis*. *FEMS Microbiol. Lett.*, 1981, **10**, 241

Robinson, D A. Campylobacter infection. *R. Soc. Hlth J.*, 1981, **101**, 138

Robinson, D A. Campylobacter infection in milking herds. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Robinson, D A. Infective dose of *Campylobacter jejuni* in milk. *Brit. med, J.*, 1981, **282**, 1584

Robinson, D A and Jones, D M. Campylobacter infections in man. (Letter)

J. R. Soc. Med., 1981, **74**, 942

Robinson, D A and Jones, D M. Milk-borne campylobacter infection. *Brit. med. J.*, 1981, **282**, 1374

Robinson, D A, Mandal, B K, Ironside, A G and Dunbar, E M. Whooping-cough: a study of severity in hospital cases. *Arch. Dis. Childh.*, 1981, **56**, 687 687

Rodgers, F G. Concentration of viruses in faecal samples from patients with gastroenteritis. In: *Viruses and wastewater treatment: proceedings of the international symposium, Guildford, 1980*, edited by M Goddard and M Butler, p. 15. Oxford, Pergamon Press, 1981

Rodgers, F G. Evaluation of preparative electron microscopy in the diagnosis of virus diseases. (Abstract) *Proc. R. microsc. Soc.*, 1980, **15**, Micro '80 Suppl., 29

Rodgers, F G. Growth of herpes simplex virus types 1 and 2 in tissues of fertile hens' eggs *in ovo* and *in vitro*. *Brit. J. exp. Path.*, 1981, **62**, 317

Rodgers, F G. *Legionella pneumophila*: detection and structure by electron microscopy. (Abstract) *Soc. gen. Microbiol. Quart.*, 1981, **8**, 124

Rodgers, F G, Chapman, S and Whitby, H J. A comparison of lyphogel, ammonium sulphate and ultracentrifugation in the concentration of stool viruses for electron microscopy. (Letter) *J. clin. Path.*, 1981, **34**, 227

Ross, J W and Clarke, S K R. Hepatitis B in dentistry: the current position. *Brit. dent. J.*, 1981, **150**, 89

Rotimi, V O and Turk, D C. Transferable multiple antibiotic resistance in *Haemophilus influenzae*. *J. antimicrob. Chemother.*, 1981, **8**, 187

Rowbotham, T J. *Legionella pneumophila*: morphological adaptions of an intracellular parasite. *I.M.L.S.N. Reg. Microbiol. Grp Proc. Meet., 1980*, 1981, pp. unnumb.

Rowbotham, T J. Pontiac fever, amoebae and legionellae. (Letter) *Lancet*, 1981, i, 40

Rowe, B. Enteropathogenic *Escherichia coli* (EPEC): importance and pathophysiology. In: *Acute enteric infections in children: new prospects for treatment and prevention*, edited by T Holme, J Holmgren, M H Merson and R Mollby, p. 101. Amsterdam, Elsevier/North-Holland, 1981

Rowe, B. Summary of open discussion. [Laboratory tools.] In: *Acute enteric infections in children: new prospects for treatment and prevention*, edited by T Holme, J Holmgren, M H Merson and R Mollby, p. 227. Amsterdam, Elsevier/North-Holland, 1981

Rowe, B and Gross, R J. The genus *Shigella*. In: *The prokaryotes: a handbook on habitats, isolation and identification of bacteria*, edited by M P Starr, H Stolp, H G Truper, A Balows and H G Schlegel, Vol. II, p. 1248. Berlin, Springer, 1981

Rowe, B, Hall, M L M, Ward, L R and De Sa, J D H. Epidemic spread of *Salmonella hadar* in England and Wales. *Environm. Hlth*, 1981, **89**, 8, reprinted from *Brit. med. J.*, 1980, **280**, 1065

Rowe, B and Threlfall, E J. Multiple antimicrobial drug resistance in enteric pathogens. J. antimicrob. Chemother., 1981, 7, 1

Rowe, B and Threlfall, E J. Multiply-resistant clones of Salmonella typhimurium in Britain: epidemiological and laboratory aspects. In: Molecular biology, pathogenicity and ecology of bacterial plasmids, edited by S B Levy, R C Clowes and E L Koenig, p. 567. New York, Plenum Press, 1981

Russell, R R B and Colman, G. Immunization of monkeys (Macaca fascicularis) with purified Streptococcus mutans glucosyltransferase. Arch. oral Biol., 1981, **26**, 23

Russell, W C, Patel, G, Precious, B, Sharp, I and Gardner, P S. Monoclonal antibodies against adenovirus type 5: preparation and preliminary characterization. J. gen. Virol., 1981, **56**, 393

Rutter, D A and Maber, H B. Plasma electrolytes in dangerous infectious diseases. (Letter) J. clin. Path., 1981, **34**, 812

Sanderson, P J, Ross, J and Stringer, J. Source of group B streptococci in the female genital tract. J. clin. Path., 1981, **34**, 84

Scawen, M D, Bown, K J and Atkinson, A. A thermostable glycerol dehydrogenase from B. stearothermophilus binding a procion dye. (Abstract) Analyt. Chem. Symp., 1981, **9**, 553

Scawen, M D, Hartwell, D R, McArdell, J E and Atkinson, A. The interaction of hexokinase from B. stearothermophilus with triazine dyes: a simple purification procedure. (Abstract) Analyt. Chem. Symp., 1981, **9**, 553

Scotland, Sylvia M, Day, N P, Cravioto, A, Thomas, L V and Rowe, B. Production of heat-labile or heat-stable enterotoxins by strains of Escherichia coli belonging to serogroups 044, 0114 and 0128. Infect. Immun., 1981, **31**, 500

Scott, R J D and Challacombe, D N. An improved sampling method to study the small intestinal microflora. (Letter) Arch. Dis. Childh., 1981, **56**, 485

Seal, D V, McGill, J, Flanagan, D and Purrier, B G A. Lacrimal canaliculitis due to Arachnia (Actinomyces) propionica. Brit. J. Ophthal., 1981, **65**, 10

Seal, D V, McSwiggan, D A, Datta, N and Feltham, R K A. Characterisation of an epidemic strain of Klebsiella and its variants by computer analysis. J. med. Microbiol., 1981, 14, 295

Seal, D V and Strangeways, J M. Epidemiology and prevention of Pseudomonas aeruginosa chest infection in an intensive care unit. Anaesthesia intens. Care., 1981, **9**, 260

Selkon, J B. The bacteriology of war wounds. J. R. nav. med. Serv., 1981, **67**, 160

Selkon, J B. The need for and choice of chemotherapy for anaerobic infections. Scand. J. infect. Dis., 1981, Suppl. 26, 19

Sellwood, Jane and Dadswell, J V. Viruses isolated from sewage 1974-77.

In: Viruses and wastewater treatment: proceedings of the international symposium, Guildford, 1980, edited by M Goddard and M Butler, p. 27. Oxford, Pergamon Press, 1981

Selwood, Jane, Dadswell, J V and Slade, J S. Viruses in sewage as an indicator of their presence in the community. J. Hyg., Camb., 1981, **86**, 217

Seth, A D. Sensitivity of gonococci to rosoxacin compared with that of penicillin, cefuroxime and tetracycline. J. antimicrob. Chemother., 1981, **7**, 331

Shafi, M S and Heimer, G V. Serological diagnosis of streptococcal endocarditis. Abstr. VIII int. Symp. Strep. strep. Dis., Lund, 1981., p. 82

Sherwood, R F and Atkinson, A. Genetic manipulation in biotechnology. Chem. Ind., 1981, No. 7, 241

Sherwood, R F and Atkinson, A. New microbes for genetic engineers. New Scient., 1981, **91**, 665

Shread, P, Donovan, T J and Lee, J V. A survey of the incidence of Aeromonas in human faeces. (Abstract) Soc. gen. Microbiol. Quart., 1981, **8**, 184

Siegler, D, Kaye, C M, Reilly, S, Willis, A T and Sankey, M G. Serum, saliva and sputum levels of metronidazole in acute exacerbations of chronic bronchitis. Thorax, 1981, **36**, 781

Simmons, L E. Diphtheria in Manchester 1977. I.M.L.S.N. Reg. Microbiol. Grp Proc. Meet., 1980, 1981, pp. unnumb.

Simpson, D I H. Other exotic viruses. Virus and Man, (Geigy), 1981, No. 12, 51

Simpson, D I H and Bowen, E T W. Recent outbreaks of severe viral haemorrhagic diseases of man. Spectrum int., 1980, **23**, 49

Sims, D G, Gardner, P S, Weightman, D, Turner, M W and Soothill, J F. Atopy does not predispose to RSV bronchiolitis or postbronchiolitic wheezing. Brit. med. J., 1981, **282**, 2086

Skirrow, M B. Acute ulceration of ileal stoma due to Campylobacter fetus subspecies jejuni. (Letter) Brit. med. J., 1981, **282**, 1978

Skirrow, M B. Campylobacter ed enterite. Argomenti Microbiol. (Oxoid Ital.), 1981, No. 1, 1, translated from Campylobacters and enteritis. Oxoid Cult., 1979, Mar., p. 1

Skirrow, M B. Campylobacter enteritis in dogs and cats: a 'new' zoonosis. Vet. Res. Commun., 1981, **5**, 13

Skirrow, M B. Should campylobacter be looked for routinely in diarrhoea? Hepato-gastroent., 1980, **27**, 415

Skirrow, M B. The taxonomy of Campylobacter. Oxoid Cult., 1981, 2, No. 2, p. 4

Skirrow, M B and Benjamin, J. Classification and distribution of 'thermophilic' campylobacters. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Skirrow, M B, Fidoe, R G and Jones, D M. An outbreak of presumptive food-borne campylobacter enteritis. *J. Infect*., 1981, 3, 234

Slack, Mary P E, Griffiths, D T and Johnston, H H. The Fluorotec system for rapid diagnosis of bacteroides infections by direct immunofluorescence of clinical specimens. *J. clin. Path*., 1981, 34, 1381

Slack, Mary P E and Nichols, W W. The penetration of antibiotics through sodium alginate and through exopolysaccharide of a mucoid strain of *Pseudomonas aeruginosa*. *Lancet*, 1981, ii, 502

Slack, Mary P E, Saunders, F C and Mayon-White, R T. Streptococcal skin infections in meat workers in Oxfordshire. *Abstr. VIII int. Symp. Strep. strep. Dis., Lund, 1981*, p. 5

Small, D A P, Atkinson, A and Lowe, C R. High-performance liquid affinity chromatography of enzymes on silica-immobilised triazine dyes. *J. Chromat*., 1981, 216, 175

Snowsill, Laureen, Towner, K J and Lewis, M J. Factors influencing the establishment and spread of R-plasmids in an experimental model of urinary tract infection. *J. Hyg., Camb*., 1981, 87, 83

Sprott, Mary S, Newman, P K, Hall, K, Welbury, R R and Ingham, H R. Subdural abscess secondary to covert dental sepsis. *Postgrad. med. J*., 1981, 57, 649

Sprott, Mary S, Selkon, J B and Ingham, H R. Methicillin-resistant staphylococci in hospitals. (Letter) *Lancet*, 1981, ii, 1106

Stanbridge, Cynthia M, Mather, J, Curry, A and Butler, E B. Demonstration of papilloma virus particles in cervical and vaginal scrape material: a report of 10 cases. *J. clin. Path*., 1981, 34, 524

Stewart, M, Hill, M J, Pugh, R C and Williams, J P. The role of *N*-nitrosamine in carcinogenesis at the ureterocolic anastomosis. *Brit. J. Urol*., 1981, 53, 115

Stringer, Jacqueline. Bacteriophages of Lancefield group B streptococci. *Abstr. VIII int. Symp. Strep. strep. Dis., Lund, 1981*, p. 17

Stringer, Jacqueline, Crees-Morris, J A, Young, S E J and Mayon-White, R T. Group B streptococcal systemic disease in Great Britain. *J. Infect*., 1981, 3, 385

Stringer, M F. Studies on *Clostridium perfringens* food poisoning. *University of London, PhD thesis*, 1981

Stringer, M F, Gilbert, R J, Hassall, J E and Wallace, J G. Carriage of *Clostridium perfringens* in different groups of the population. (Abstract) *J. appl. Bact*., 1981, 51, xvi

Supran, E Margaret, Gardner, P S, Cayzer, I, Court, G and Chalmers, S. Comparison of a modified microagglutination technique for HBsAg with the standard technique and a new RIA system. *J. clin. Path*., 1981, 34, 1396

Sutehall, G M. The use of trypsin to enhance the infectivity of influenza

Virus A for MDCK cells. Brunel University, MSc thesis, 1981

Talbot, M D and Collins, B N. Presumed sexual transmission of meningococci. J. Infect., 1981, 3, 273

Taylor, A G. Legionnaires' disease; the facts. Med. Lab. World, 1981, 5, No. 1, p. 12

Taylor, A G and Harrison, T G. Formolised yolk sac antigen in early diagnosis of legionnaires' disease caused by Legionella pneumophila serogroup 1. Lancet, 1981, ii, 591

Taylor, A G and Harrison, T G. Legionnaires' disease caused by Legionella pneumophila group 3. Lancet, 1979, ii, 47

Taylor, A G, McLaughlin, J, Green, H T, Macaulay, M B and Audurier, A. Hospital cross-infection with Listeria monocytogenes confirmed by phage-typing. (Letter) Lancet, 1981, ii, 1106

Taylor, C E D. Slow progress in developing rapid methods and automation in clinical and public health microbiology. Oxoid Cult., 1981, 2, No. 2, p. 1

Taylor, J A and Barrow, G I. A non-pathogenic vibrio for the routine quality control of TCBS cholera medium. J. clin. Path., 1981, **34**, 208

Taylor, J A and Barrow, G I. A non-pathogenic vibrio for the routine quality control of TCBS medium. (Abstract) Trans. R. Soc. trop. Med. Hyg., 1981, **75**, 889

Taylor, R H, Borriello, S P and Taylor, A J. Isolation of Clostridium difficile from the small bowel. Brit. med. J., 1981, **283**, 412

Tedder, R S, Mortimer, P P and Lord, R B. Detection of antibody to varicella-zoster virus by competitive and IgM-antibody capture immunoassay. J. med. Virol., 1981, **8**, 89

Thomas, Mair E M. [Re: Room temperature coagulase production by Staphylococcus aureus strains.] (Letter) Clin. Microbiol. Newsl., 1981, **3**, 20

Thomas, Mair E M, Luton, P and Mortimer, J Y. Virus diarrhoea associated with pale fatty faeces. J. Hyg., Camb., 1981, **87**, 313

Thompson, M H and Hill, M J. The role of bacterial metabolism in the gut in relation to large bowel cancer. In: Progress in environmental mutagenesis and carcinogenesis, edited by A Kappas, p. 41. Amsterdam, Elsevier/North-Holland, 1981. (Progress in Mutation Research 2)

Tillett, Hilary E. Monitoring infectious diseases using routine microbiology data. II. An example of regression analysis used to study infectious gastroenteritis. J. Hyg., Camb., 1981, **86**, 59

Tillett, Hilary E and Thomas, M E M. Monitoring infectious diseases using routine microbiology data. I. Study of gastroenteritis in an urban area. J. Hyg., Camb., 1981, **86**, 49

Tobin, J O'H, Bartlett, C L R, Waitkins, S A, Barrow, G I, Macrae, A D, Taylor, A G, Fallon, R J and Lynch, F R N. Legionnaires' disease: further evidence to implicate water storage and distribution systems as

sources. *Brit. med. J.*, 1981, **282**, 573

Tobin, J O'H, Swann, R A and Bartlett, C L R. Isolation of *Legionella pneumophila* from water systems: methods and preliminary results. *Brit. med. J.*, 1981, **282**, 515

Towner, K Y and Pinn, P A. A transferable plasmid conferring only a moderate level of resistance to trimethoprim. *FEMS Microbiol. Lett.*, 1981, **10**, 271

Tullo, A B, Richmond, S J and Easty, D L. The presentation and incidence of paratrachoma in adults. *J. Hyg., Camb.*, 1981, **87**, 63

Turk, D C. Systemic *Haemophilus influenzae* and facial cellulitis in infants. (Letter) *Brit. med. J.*, 1981, **282**, 1078

Turk, D C and Cruickshank, J G. Significance of *Haemophilus influenzae* type-C. (Letter) *Lancet*, 1981, ii, 536

Turnbull, P C B. *Bacillus cereus* toxins. *Pharmacol. Ther.*, 1981, **13**, 453

Turnbull, P C B and Rose, P. *Campylobacter jejuni/coli* in raw red meats: a Public Health Laboratory Service survey. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Vandervelde, Elise M and Mortimer, P P Sporadic acute non-B hepatitis in England. (Abstract) *Trans. R. Soc. trop. Med. Hyg.*, 1981, **75**, 889

Venitt, S, Pickering, S P, Hill, M J and Fernandez, F. The use of bacterial fluctuation tests in studies of mutagenic activity in human faeces. In: *Gastrointestinal cancer: endogenous factors*, edited by W R Bruce, P Correa, M Lipkin, S R Tannenbaum and T D Wilkins, p. 239. Cold Spring Harbor Laboratory, 1981. (Banbury Report 7)

Wain, W H, Georgakopoulos, L and Mackenzie, D W R. Candida antibodies in heart surgery patients. *J. Infect.*, 1981, **3**, 237

Waitkins, Sheena A, Anderson, D R and Todd, F K. An evaluation of the API-STREP identification system. *Med. Lab. Sci.*, 1981, **38**, 35

Waitkins, Sheena A and Thomas D J. Isolation of *Trichomonas vaginalis* resistant to metronidazole. (Letter) *Lancet*, 1981, ii, 590

Walker, Jacqueline R. An immunoradiometric assay for human leucocyte interferon using a monoclonal antibody. *University of London, MSc thesis*, 1981

Wandless, Irene, Narang, H K and Evans, J G. Rotavirus infection in elderly patients. *Age and Ageing*, 1981, **10**, 36

Wardle, J K, Selkon, J B, Ingham, H R and Freeman, R. Ceftazidime in gram-negative infections: three case reports. *J. antimicrob. Chemother.*, 1981, **8**, Suppl. B, 313

Warhurst, D C and Mann, P G. Primary amoebic meningoencephalitis in Bath Spa, England. (Abstract) *II int. Conf. Biol. Pathogenicity small free-living Amoebae, Gainesville, Fla, 1980*, p. 55

Warrell, Mary J, Tobin, J O'H and Wald, N J. Examination for influenza IgA and IgM antibodies in pregnancies associated with fetal neural-tube

defects. *J. med. Microbiol*., 1981, 14, 159

Warren, R E, Boissard, J and Whetstone, R J. General advice about antibiotics. (Letter) *Lancet*, 1981, i, 331

Watson, G N, Stringer, M F, Gilbert, R J and Mahony, D E. Development and application of a bacteriocin-typing scheme for *Clostridium perfringens*. (Abstract) *J. appl. Bact*., 1981, 51, xx

Wayne, L G, Good, R C, Krichevsky, M I, Beam, R E, Blacklock, Z, Chaparas, S D, Dawson, D, Froman, S, Gross, W, Hawkins, J, Jenkins, P A, *et al*. First report of the cooperative, open-ended study of slowly growing mycobacteria by the International Working Group on Mycobacterial Taxonomy. *Int. J. syst. Bact*., 1981, 31, 1

Webster, M H, Waitkins, S A and Stott, A. Impaired bacteriological responses in babies after maternal iron dextran infusion. *J. clin. Path*., 1981, 34, 651

Weindling, A M, Hawkins, J M, Coombes, M A and Stringer, J. Colonisation of babies and their families by group B streptococci. *Brit. med. J*., 283, 1503

Weindling, A M, Hawkins, J M, Stringer, J and Coombes, M A. Group B streptococcal serotypes correlated with maternal parity and carrier sites. *J. clin. Path*., 1981, 34, 1405

Westmacott, D, Hall, M J, Hassall, C H, Lees, L J, Rowe, B and Ward, L. Activity of alafosfalin against bacterial pathogens of the gastro-intestinal tract *in vitro* and *in vivo*. *Abstr. XII int. Congr. Chemother., Florence, 1981*, p. 168

White, Diana G and Gill, P. An epidemiological study of campylobacter enteritis in the Bath Health District. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

White, R J, Blainey, A D, Harrison, K J and Clarke, S K R. Causes of pneumonia presenting to a district general hospital. *Thorax*, 1981, 36, 566

Widdowson, Jean P and Wormald, P J. Streptococcal antibodies in patients with burn injuries. *J. Hyg., Camb*., 1981, 86, 265

Wilkinson, A E. Basic research on treponemal disease. In: *Recent advances in sexually transmitted diseases*, No. 2, edited by J R W Harris, p. 79. Edinburgh, Churchill Livingstone, 1981

Wilkinson, P J. Epidemiology and clinical importance of aminoglycoside-resistant *Serratia marcescens* in Plymouth. In: *Bacterial resistance to aminoglycoside antibiotics: proceedings of the symposium, Bad Honnef, 1981*, edited by B Wiedmann and D S Reeves, p. 230. Munchen, Byk-Essex, 1981

Wilkinson, P J, Beddis, I R, Challenor, J, Perham, T G M, Bax, R P and Ward, G T. Pharmacological and clinical study of cefotaxime in the newborn. *Abstr. XII int. Congr. Chemother., Florence, 1981*, p. 77

Willemse-Collinet, M F, Turnbull, P C B, Hospers, G T and Oppenraay, A B W G van. Computer-assisted method for identification of *Bacillus* species isolated from liquid antacids. *Appl. environm. Microbiol*., 1981, 41, 169

Williams, *Sir* R E O. Closing remarks. [Symposium on nosocomial infections, Atlanta, 1980.] *Amer. J. Med*., 1981, **70**, 986, reprinted in *Nosocomial infections*, edited by R E Dixon, p. 319. New York, Yorke Medical Books, 1981

Williams, *Sir* R E O. In pursuit of safety. *J. clin. Path*., 1981, **34**, 232

Williams, *Sir* R E O. Terrestrial epidemiology. *Phil. Trans. A*, 1981, **303**, 625

Williams, *Sir* R E O. Tribute to Ogston's coccus: a paradigm of the modern carrier problem. In: *The staphylococci: proceedings of the Alexander Ogston centennial conference*, edited by A Macdonald and G Smith, p. 265. Aberdeen University Press, 1981

Willis, A T. The classification of anaerobes of clinical importance. *G. Mal. infett. parassit*., 1981, **33**, 888

Willis, A T. The management of anaerobic infections. *Indian J. Surg*., 1981, **43**, No. 1, Spec. Suppl., 69

Willis, A T. The role of nitroimidazole derivates in bacterial infections: metronidazole prophylaxis in appendectomy. *Scand. J. infect. Dis*., 1981, Suppl. 26, 24, preprinted in *Metronidazole in the prevention and treatment of anaerobic infections from the Luton and Dunstable Hospital, 1973-1979*, p. 82. Old Woking, Gresham Books Ltd, 1980

Willshaw, Geraldine A, Barclay, E A, Smith, H R, McConnell, M M and Rowe, B. Molecular comparison of plasmids coding for production of colonization factor antigen I and heat stable enterotoxin from enterotoxogenic *Escherichia coli*. (Abstract) *Soc. gen. Microbiol. Quart*., 1981, **8**, 101

Wolf, J and Sharp, R J. Taxonomic and related aspects of thermophiles within the genus *Bacillus*. In: *The aerobic endospore-forming bacteria: classification and identification*, edited by R C W Berkeley and M Goodfellow, p. 251. London, Academic Press, 1981. (Society for General Microbiology Special Publication No. 4)

Woodruff, A W, Bowen, E T W and Platt, G S. Viral infections as causes of pyrexia of unknown origin in travellers from tropical Africa. (Abstract) *Trans. R. Soc. trop. Med. Hyg*., 1981, **75**, 890

Wright, A E. Poster demonstration of microbiological safety methods. (Abstract) *Trans. R. Soc. trop. Med. Hyg*., 1981, **75**, 891

Wright, E P. Duration of excretion period of *Campylobacter jejuni/coli* in human subjects. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Yates, M D and Collins, C H. Sensitivity of opportunist mycobacteria to rifampicin and ethambutol. *Tubercle, Lond*., 1981, **62**, 117

Young, Susan E J. Human campylobacter infections 1977-1980: national data based on routine laboratory reporting. *Abstr. P.H.L.S. int. Workshop Campylobact. Infect., Reading, 1981*, pp. unnumb.

Zadik, P M and Dadswell, J V. Stridor. (Letter) *Brit. med. J*., 1981, **283**, 560

BOOKS

Citron, K M, Raynes, R H and Berrie, J R H. Tuberculosis today. London, H.M.S.O., 1981. (Department of Health and Social Security Topics of our Time No. 3)

Collins, C H, Allwood, M C, Bloomfield, S F and Fox, A, eds. Disinfectants: their use and evaluation of effectiveness. London, Academic Press, 1981. (Society for Applied Bacteriology Technical Series No. 16)

Jephcott, A E. Investigation of gonococcal infection. London, British Medical Association, 1981. (Association of Clinical Pathologists Broadsheet No. 100)

Mackenzie, D W R and Philpot, C M. Isolation and identification of ringworm fungi. London, H.M.S.O., 1981. (Public Health Laboratory Service Monograph Series No. 15)

Quirk, A V. Special wastes: a technical memorandum providing guidance on their definition. London, H.M.S.O., 1981. (Department of the Environment Waste Management Paper No. 23)

Rowe, B and Hall, M L M. Kauffmann-White scheme, 1980. London, C.P.H.L., 1981

Willis, A T, Jones, P H and Reilly, S. Management of anaerobic infections: prevention and treatment. Letchworth, Research Studies Press, 1981

REPORTS OF THE PHLS, INCLUDING REPORTS OF COMMITTEES AND WORKING PARTIES

Annual report for 1979/80. London, 1981

Communicable disease report: United Kingdom, July to September 1980; October to December 1981; January to March 1981; April to June 1981, prepared by the Communicable Disease Surveillance Centre of the Public Health Laboratory Service and the Communicable Diseases (Scotland) Unit. Community Med., 1981, 3, 69, 169, 260, 337

A comparison of confirmatory media for coliform organisms and Escherichia coli in water, by a Joint Committee of the Public Health Laboratory Service and the Standing Committee of Analysts. J. Hyg., Camb., 1981, **87**, 369

Contaminated standard dressings BPC. Hlth Haz. Note HN (HAZARD) (81) 17 (15. xii. 1981)

A five year study of influenza in families: joint Public Health Laboratory Service/Royal College of General Practitioners Working Group. J. Hyg., Camb., 1981, **87**, 191

Food poisoning and salmonellosis surveillance in England and Wales: 1980. A. Laboratory reports. B. Reports from Medical Officers for Environmental Health and Environmental Health Officers. P.H.L.S. Commun. Dis. Rep., 1981, No. 28, 3, No. 29, 3, and edited version in Brit. med. J., 1981, **283**, 924

Food poisoning and salmonellosis surveillance in England and Wales: 1981. Reports from MOsEH and EHOs: January to June 1981. P.H.L.S. Commun. Dis. Rep., 1981, No. 29, 6

Infection control organizations in hospitals in England and Wales, 1979: report of a survey undertaken by a Public Health Laboratory Service/National Health Service Working Party on Hospital Infection. Hlth Trends, 1981, **13**, 93

Infectious disease in England and Wales in 1979. J. Infect., 1981, **3**, 93

Leptospirosis in man, British Isles, 1979-80. Brit. med. J., 1981, **282**, 2066

Public Health Laboratory Service Board accounts 1979-80. London, H.M.S.O., 1981. (House of Commons Papers (Session 1980-1) No. 304)

Quality control manual. London, 1981

Report on the National Survey of Infection in Hospitals, 1980. J. Hosp. Infect., 1981, **2**, Suppl.

Specifications for laboratory autoclaves, by the Public Health Laboratory Service Subcommittee on Laboratory Autoclaves. J. Hosp. Infect., 1981, **2**, 377

REPORTS OF COMMITTEES AND WORKING PARTIES OF OTHER ORGANISATIONS TO WHICH MEMBERS OF STAFF HAVE CONTRIBUTED

Association of Clinical Pathologists. Laboratory diagnosis of Legionnaires' disease. London, British Medical Association, 1981. (Association of Clinical Pathologists Broadsheet No. 99) (Report prepared by R J Fallon for the Informal Working Party on Legionnaires' Disease)

British Thoracic Association. A controlled trial of six months chemotherapy in pulmonary tuberculosis. First report: results during chemotherapy. Brit. J. Dis. Chest, 1981, **75**, 141

Chartered Institution of Building Services: Engineering Practice Committee. Legionnaires' disease. J. chart. Inst. build. Serv., 1981, **3**, No. 3, p. 35

Department of the Environment/National Water Council: Standing Committee of Analysts. Methods for the examination of waters and associated materials. London, H.M.S.O., 1981

Department of the Environment/National Water Council: Standing Committee of Analysts to Review Standard Method for Quality Control of the Water Cycle, Second report February 1977 - April 1979. London, Department of the Environment, 1981

Department of Health and Social Security. The collection and storage of human milk: report of a Working Party on Human Milk Banks, Panel on Child Nutrition, Committee on Medical Aspects of Food Policy. London, H.M.S.O., 1981. (Reports on Health and Social Subjects No. 22)

Department of Health and Social Security. Third report of the advisory group on testing for the presence of hepatitis B surface antigen and its antibody. (Chairman: W J Jenkins) 1981

Department of Health and Social Security: Advisory Group on the Management of Patients with Spongiform Encephalopathy Creutzfeldt-Jakob Disease (CJD). Report to the Chief Medical Officers of the Department of Health and Social Security, the Scottish Home and Health Department and the Welsh Office. London, H.M.S.O., 1981

Essex Hospitals. Choosing an antibiotic 1981. Chelmsford, Abbott Laboratories, 1981

European Communities: Economic and Social Committee. Genetic engineering, safety aspects of recombinant DNA work. Colloquy organized by the Economic and Social Committee on 14 and 15 May 1981 in Brussels. Brussels, Economic and Social Committee Press, Information and Publications Division, 1981

National Water Council: Microbiological Working Group. Guide to the microbiological implications of emergencies in the water service. London, National Water Council, 1981

Newcastle Covert Bacteriuria Research Group. Covert bacteriuria in schoolgirls in Newcastle upon Tyne: a 5-year follow-up. Arch. Dis. Childh., 1981, **56**, 585

Office of Population Censuses and Surveys and Communicable Disease Surveillance Centre of the Public Health Laboratory Service. Communicable disease statistics. Pt 1. 1979 Annual review. Pt 2. 1979 Statistical tables. London, H.M.S.O., 1981. (Series MB2 No. 6)

Ross Institute. Malaria prevention in travellers from the United Kingdom: report of meetings convened by the Ross Institute. Brit. med. J., 1981, **283**, 214

Royal College of General Practitioners. Effect of a low pertussis vaccination uptake on a large community: report from the Swansea Research Unit of the Royal College of General Practitioners. Brit. med. J., 1981, **282**, 23

Royal College of General Practitioners and the Public Health Laboratory Service. Long-term study of influenza in families. J. R. Coll. gen. Practit., 1981, **31**, 351

Trimethoprim Study Group. Comparison of trimethoprim at three dosage levels with co-trimoxazole in the treatment of acute symptomatic urinary tract infection in general practice. J. antimicrob. Chemother., 1981, **7**, 179

West Midlands Regional Health Authority: Working Party on Control of Hospital Infection. Control of hospital infection: a practical handbook, 2nd edn, edited by E J L Lowbury, G A J Ayliffe, A M Geddes and J D Williams. London, Chapman and Hall, 1981

World Health Organization. Guidelines for laboratory facilities and containment equipment and isolation facilities for persons infected with dangerous pathogens: WHO/CAMR meeting, (Porton Down, 20-24 October 1980). WHO/CDS/SMM/80.17(Rev.1), 1980. (World Hlth Org. working document)

World Health Organization. Rapid laboratory techniques for the diagnosis of viral infections: report of a WHO scientific group. Tech. Rep. Ser. World Hlth Org., 1981, No. 661

World Health Organization. WHO/CAMR meeting on guidelines for biological safety cabinets, Porton Down, 27-29 October 1981. WHO/CDS/SMM/81.21, 1981. (World Hlth Org. working document)

World Health Organization. WHO yearly virus report, 1979. Prepared by the WHO Virus Disease Unit. WHO/VIR/81.3, 1981. (World Hlth Org. working document)

World Health Organization: Expert Committee on Biological Standardization. Evaluation of candidate international reference reagents and a microimmunodiffusion test for the identification of precipitins to the H and M antigens of histoplasmin: a report of a collaborative study. WHO/BS/81.1308, 1981. (World Hlth Org. working document)

World Health Organization: Regional Office for Europe. Surveillance of acute viral respiratory infections in Europe: report on a WHO symposium, Madrid, 2-6 June 1980. WHO EURO Rep. Stud., 1981, No. 47

World Health Organization: Regional Office for Europe. The risk to health of microbes in sewage sludge applied to land: report on a WHO working group, Stevenage, 6-9 January 1981. WHO EURO Rep. Stud., 1981, No. 54

Accounts of the PHLS Board 1981/2

The two tables on the following pages provide a summary of the accounts of the PHLS Board for 1981/2. These tables represent an abbreviated statement of transactions for 1981/2, which has yet to be subjected to formal government audit.

PUBLIC HEALTH LABORATORY SERVICE BOARD
(National Health Service Act 1977 (Eliz 2, C.49)

1 ACCOUNTS OF RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31 MARCH 1982

RECEIPTS

Prior year ended 31 March 1981			
£		£	£
123,765	Balance 1 April 1981		63,102
25,005,770	Department of Health & Social Security Advances		31,214,216
1,219,622	Welsh Office Advances		1,356,673
	Public Health Laboratory Service Laboratories:		
	Grants from other organisations:		
2,117	World Health Organisation	33,059	
52,314	Medical Research Council	108,486	
63,386	Cancer Research Campaign	83,022	
47,194	Other bodies	78,372	302,939
	Proceeds of Sales, fees, etc:		
12,756	Sales of Cultures and reagents	33,082	
122,945	Central Supply Services to other bodies	147,120	
9,545	Laboratory Service Fees	81	
1,684,053	Rechargeable salaries and services	2,258,035	
5,156	Bench Fees	26,625	
1,081	Rent and other receipts from staff	-	
6,964	Other receipts	26,326	2,491,269
	Centre for Applied Microbiology and Research:		
	Grants from other organisation:		
36,909	Medical Research Council	33,677	
33,348	Cancer Research Campaign	29,303	
	Other bodies	132,079	195,059
	Proceeds of Sales, fees, etc:		
840,121	Sales of products etc.	948,538	
928,028	Other receipts	912,844	1,861,382
	Capital work recharged:		
	PHLS	45,770	
	CAMR	178,680	224,450
£30,195,074			£37,709,090

PAYMENTS

Prior year ended 31 March 1981		Salaries incl. Superannuation Contributions	Other Expenditure	TOTAL
£		£	£	£
	Current:			
1,155,887	Administration	506,189	619,467	1,125,656
4,489,533	Central & Special Labs.	3,527,648	1,492,519	5,020,167
4,888,712	Centre for Applied Microbiology & Research	2,693,949	2,698,366	5,392,315
13,921,623	Constituent Laboratories	12,032,766	3,839,772	15,872,538
	Central Supply Services:			
101,057	Excess of Purchase over issues	-	161,585	161,585
151,921	Central Services	124,538	77,539	202,077
	Total Current Payments	18,885,090	8,889,248	27,774,338
	Capital:			
1,577,322	New Buildings and associated equipment			4,608,717
3,845,917	Receipts surrendered to the Consolidated Fund			5,075,099
63,102	Balance 31 March 1982			250,936
£30,195,074				£37,709,090

The cost of this service, administered by the Public Health Laboratory Service Board was borne on Health and Personal Social Services, England, Class XI, Vote 1, and for the Welsh Laboratories on Class XVI, Vote 1.

STATEMENT OF LOSSES ETC.

Cases of loss or compensation totalled £7,377; 2 theft of equipment £5,182; 1 bad debt (salary overpayment) £380; 36 compensation payments £1,815.

II ACCOUNT OF SPECIAL FUNDS FOR THE YEAR ENDED 31ST MARCH 1982

RECEIPTS		PAYMENTS	
	£		£
Balance at 1 April 1981	44,477	Staff and Supplies from:	
Grant from:		British Diabetic Association Grant	13,014
		World Health Organisation Grant	2,237
		European Economic Community Grant (Poole)	7,976
British Diabetic Association	4,728	European Economic Community Grant (CAMR)	1,928
World Health Organisation	1,242	Ascorbate Fund	3,436
European Economic Community	240	Headquarters Fund	215
University of London	1,068	Swansea Laboratory Account	2,236
		Central Library Account	1,038
Donations	8,916	Portsmouth Laboratory Account	3,517
		Microbiology Quality Control Laboratory Account	193
Bank Interest	4,948	Ipswich Laboratory Account	40
		Peterborough Laboratory Account	122
		Central Endowment Fund	2
		Newcastle Laboratory Account	1,524
		Chester Laboratory Account	2,408
		Nottingham Laboratory Account	9,203
		CPHL Marmoset Account	918
		CPHL Rabies Account	32
		Balance at 31st March 1982	15,580
	£65,619		£65,619

New Buildings: Capital Expenditure

The following sums were expended on capital projects throughout the Service during 1981/2. Expenditure on major projects at CAMR, on the new laboratories at Colindale and on minor works have been excluded.

Completed before 1.4.82	£
CDSC offices	216 377
Luton	185 160
In progress, 1.4.82	
Ashford	22 200
Birmingham (Special Pathogens Laboratory)	98 505
Cambridge	39 350
Epsom	135 115
Gloucester	220 050
Hereford	65 438
Leeds (Special Pathogens Laboratory)	125 158
Liverpool (Special Pathogens Laboratory)	67 663
Norwich	35 867
Peterborough	28 583
Tooting	142 243
	£1 381 709

In many cases, projects were planned and carried out with the valued help and co-operation of Regional and District Health Authorities.